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45. 1593.

AGRICOLA'S LETTERS AND ESSAYS

ON

SUGAR FARMING

IN

JAMAICA.

BY

W. F. WHITEHOUSE, ESQ.

BODLEIANA BIBLIOTHECA

LONDON:
SIMMONDS & WARD, 18, CORNHILL.

1845.

THE following Letters and Essays, which appeared originally in the *Royal Gazette and Jamaica Standard*, were thence reprinted in a collected form (while the type was standing) at the wish of several friends, who considered that they might be circulated with some advantage in the neighbouring Islands, and other Sugar-growing Colonies.

The disadvantages of a Colonial Printing-Office must prove an excuse for the "getting-up" of the work.

Jamaica, 1845.

PRINTED AT THE OFFICE OF THE "JAMAICA TIMES."

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⁂ The Author must apologise to the Public for the several errors which have crept into the Printing. Living at a distance from the Printer, with only a communication once a week by post, it was impossible to keep the matter in type till the proof-sheet could be corrected.

ERRATA.

PAGE
4. For 'where the land is not too STRONG,' read 'STONY.'
11. For 'increased produce of the last,' read 'East.'
19. For 'PULLING the canes on the cane carrier,' read 'PUTTING.'
20. For 'clean out the WHOLE,' read 'HOLE.'
21. After 'the brown is the sugar, as potted in the hogsheads direct from the pan,' insert 'the white vacuum pan sugar is run from the pan,' into cast-iron coolers, &c.
23. For 'it contained 2¾ acres,' read 12¾ acres.'
40. For 'I used to dig up the cane-HOLES,' read 'cane-STOOLS.'
46. For 'the Tullian system has now stood the BEST of experience,' read 'TEST.'
61. For 'an inference was to be drawn in every ACRE,' read 'every CASE.'
72. For 'and as to the MIDDLE of the holes,' read 'WIDTH.'
For 'I am inclined to prefer the convenience it affords for ploughing,' read 'to prefer THE LATTER FOR the convenience.'
86. For 'to allow the natural course of events,' read 'FOLLOW.'
92. Bottom line, dele 'NOT.'
95. For 'take a walk into my curing-house and see my process of boiling the sugar,' read 'CURING the sugar.'
154. For 'namely IN THE CULTIVATION of carbon and sugar,' read 'namely THE FORMATION of.
155. For 'the source of lime for a new generation,' read 'SOURCE OF ELEMENTS.'
158. For 'the same result then ensues as when ornamental to larger ones;' after 'ORNAMENTAL' insert 'SHRUBS OR FLOWERS ARE REMOVED FROM SMALL POTS to larger ones.'
162. For 'BENEFICIALLY illustrated by the experiments,' read 'BEAUTIFULLY.'
185. For 'each part of it will only BE half the vigour,' read 'HAVE half the vigour.'
192. For 'for the furnishing of fresh SOIL for the plants,' read 'fresh FOOD.'
208. For 'if twice after any party is inclined to trash the canes once or the cultivation with horse-hoes is complete,' read 'If any party is inclined to trash the canes once or twice after the cultivation with horse-hoes is complete.'

PAGE

216. For 'a SMALLER frame-work like the bulk of a rake or comb in front of the COLLIERS,' read 'SMALL frame in front of the ROLLERS.'

241. For 'by this mode than by ANOTHER at present pursued,' read 'ANY OTHER.'

248. For 'the SUFFICIENT fodder usually supplied to the pens,' read 'SUCCULENT fodder.'

253. For 'HOEING through plants every month,' read 'GOING through plants.'

257. For 'REPAIRING land for green crops,' read 'PREPARING land.'

259. For 'a few WEEKS removed,' read 'few INCHES.'

265. For 'thin planting is preferable to THIN planting,' read 'to THICK planting.'

280. For 'The FOLLOWING should take place,' read 'FALLOWING.'

287. For 'everything NOW has its reason assigned,' read 'everything NEW.'

296. For 'and at LEAST a green crop we get certainly,' read 'at LAST.'

299. For 'but to produce sugar AND GLUTEN,' read 'and NOT gluten.'

311. For 'exact quantity of unripe SAP from the ripe cane,' read 'unripe TOP.'

320. For 'the rails of the road being laid down,' read 'BEFORE being laid down.'

321. For 'the whole weight of the load ABOUT AN INCH rests,' dele 'ABOUT AN INCH.'

330. For 'slips of wood about THIRTEEN inches high,' read 'THREE inches.'

335. For 'liquor can granulate through not FINELY,' read 'not FREELY.'

336. For 'partly in the second teache OR SACCHARINE,' read 'AS SACCHARATE.'

342. For 'kind of BOARD funnel,' read 'BROAD funnel.'

AGRICOLA'S

LETTERS AND ESSAYS.

ON THE USE OF THE PLOUGH.

TO THE EDITOR OF THE ROYAL GAZETTE AND JAMAICA STANDARD.

April, 1841.

As there are some points intimately connected with the welfare of this Island to which public attention dees not appear to be sufficiently drawn, permit me to mention some of them in the hopes that the subject may be taken up by abler hands, and that by being fully discussed, the truth may be made so apparent, that parties being convinced of the benefit to be derived, may no longer delay the adoption of the measures proposed for their welfare.

The first object I wish to call attention to, is the great benefit to be derived from the free use of the plough. To those who have already experienced the benefit of the plough, it may appear quite unnecessary for me to enter on the subject, but when I look around me, and see so many estates jogging on in the old way, notwithstanding the example set them by neighbouring properties, I do think it necessary to call the attention of the absentee proprietors to what so intimately concerns their interest. It appears that the "pressure from without" is necessary to induce many to alter their plans, if therefore the absentee proprietors, after reading the following statement, feel convinced of the truth of it, let them immediately insist on the adoption of the plough wherever possible; they will soon find that the outcry of a scarcity of labourers will be gradually decreased. I do not mean to say that in consequence of the use of the plough, there will be no occasion for immigration, but the necessity of it will be very much reduced, and on many estates it will be quite unnecessary.

The usual arguments against the use of the plough are, the want of stock;—that is easily rectified by buying more, and the number is not so great as most people suppose, few estates requiring more than 20 cattle to be kept for the use of the plough. The want of feeding for the stock;—that must be rectified by making the cattle plough the land to produce their own feeding, the same as done in the green crop system at home. The having (in some places) to encounter the present deep trenches, the beds by the plough can be rounded up, so that there would be a regular slope off to the trench, and therefore the deep trenches done away with. The difficulty of the breaking in the cattle and the people to the system,—a paltry excuse, but one, I am sorry to say, too often made; there is no difficulty to be overcome without trouble, and therefore it must be expected in this case. The land being too stony, and too steep, stones and stumps to a moderate extent may be overcome by the plough; land at an angle of 30 or 40 degrees, may be ploughed, as I have proved by my own experience, and although much more expensive than ploughing level land, it can yet be done at a less cost than digging cane holes. Lastly, that pulverising the soil, and exposing it to the sun are injurious; I have heard this argument used, and therefore mention it. Whoever has had experience in farming at home, must know the benefit of summer fallowing, and the effect of pulverising the soil by constant cultivation, where the rotation of green crops is adopted. All the difficulties above enumerated, the writer has had to encounter, and has overcome them, as every person must, who is determined to do so.

Before proceeding farther, it is necessary to mention, that when I speak of the benefit to be derived from ploughing, I do not mean the practice I see in some places adopted, of putting a plough into a sward of grass, and endeavouring to make a cane hole at once—such a system is not worthy the name of ploughing. But when I speak of ploughing, I mean turning the soil completely over, then harrowing it well, and afterwards ploughing the cane-hole.

As it requires something more than mere assertion to induce people to alter their usual practice, I now proceed to give you a comparative view of the two systems, namely, digging cane-holes in the old way, with hoes, and making them with the plough. Two cane pieces of the same size, level land, and in grass, were put in without manure, at the same time; one was dug in the common way, at the rate of 70 holes for 2s.; the other was the first piece upon which the plough was tried. I had not only to teach the people, and break in the cattle, but in a great measure to teach myself the use of the plough, having had very little previous experience.—Ten cattle were used, and of course an extra number of people to drive them.

The Cost of the dug caneholes and lining off was - £27 9 1	The cost of ploughing entirely over, harrowing and ploughing caneholes - - - £13 1 6
Picking plant tops and planting in the usual way, tolerably thick along the row - - £18 8 3	Picking plant tops and planting one top every three feet along the row - - - - £4 12 0
Weeding and supplying, and picking tops to supply, the weather having been very dry, and great failure having taken place, £20 4 6	Weeding and supplying and picking tops to supply, very few having failed owing to the soil being well pulverised, £4 4 0
Cleaning till the time of cutting - - - £57 16 0	Cleaning till the time of cutting - - - £20 19 0
Total cost - - £123 17 10	Total cost - - £42 16 6

From the above it will appear that, notwithstanding the difficulties to be encountered in first commencing with the plough, the ploughed holes did not cost the half of the dug holes. With regard to the planting, the ploughed land cost just one-fourth as much as the old fashioned caneholes. It was foreseen that from the fine state of the soil every top would grow in the ploughed part, the tops were therefore planted thin; the result justified the expectation as is shown by the comparative cost of weeding and supplying, the ploughed part being about one-fifth the expense of the other. And here is shown one of the greatest advantages of the plough; the tops will all grow though planted in dry weather! The land being ploughed in dry weather, the soil was completely pulverised; and the grass got rid of so completely, that there was not a blade to be seen for weeks afterwards; and when seedlings did begin to grow, the least touch of a hoe destroyed them. On the other hand, the caneholes being dug through the grass, the grass roots were safely buried in the bank, and although the dry weather would not let the canes grow, the grass being already established grew fast enough. The advantage gained in this part of the experiment is nearly two-thirds, as seen above.

Having now, I hope, fully explained the above statement of the cost by each method, it only remains to state the comparative produce.—The dug caneholes made 7 hogsheads, the ploughed ones 10.

After this, surely, I may ask the proprietors, will you not give the plough a fair trial? Some people do not like to be put out of their old habits, I say, however, take no excuse; planters, like the present ministry, are made of "squeezable materials;" but firmly insist upon its being adopted wherever possible, and let me assure you it is possible on the great majority of estates, and that on many hilly estates, where the land is not strong, it can be adopted. The complaint is general of a want of labour, then why not make the best use of the means you already possess, why not make cattle do the work of human beings where possible, it must infallibly tend to increase the available population, by throwing the cane hole diggers into the labor market. The wages saved in the above piece being £81,—and the average price of labour, 1s. 6d. a-day, I saved the labor of 1080 people for one day; or rather the ploughing of one piece gave me that amount of labor to apply to other objects, which I must otherwise have been short of: What then must be the effect, when estates put in from 50 to 60 acres of plants per annum? I stated above that I had 10 cattle, and additional people to break in the cattle, I now do all the work with six cattle, and the ploughman has now one big boy, and two little ones, to assist him. I am satisfied that now the cattle are regularly broken to the work, they could plough the stiffest land in the dryest weather. I have purposely avoided mentioning the width of the caneholes, the use of horse hoes, &c., for cleaning between the canes, as I may refer to these and other subjects connected with the agricultural well-being of the Island at a future period; at present I wish to confine myself to recommending the use of the plough, and if I should be the means of inducing any, however few, to adopt it, it will be a great gratification to

AGRICOLA.

ON THE USE OF THE PLOUGH.

No. II.

TO THE EDITOR OF THE ROYAL GAZETTE AND JAMAICA STANDARD.

MAY 3RD, 1841.

As you were good enough to give insertion to my last communication, I venture to address you again on the same subject ; it is one of the most vital importance to the welfare of the colony : more particularly now that the price of sugar is falling, does the general adoption of the plough become requisite. I am not surprised at the benefits to be derived from the use of the plough appearing in a new light to you, as I have found few, even of my agricultural friends, who have been aware of the full benefit. I must beg you, however, to make the printer's devils a little more cautious ; they make me in one place state that land is too strong for ploughing, it should have been too stony, one of my chief arguments being that no land is too strong, that is to say, too stiff for the plough. Also, with reference to the saving in planting, they make use of the word ploughing, instead of planting, which makes the sense obscure.

Before proceeding further, AGRICOLA begs to remain incog : the public benefit is all he aims at, and the being known, might cause interested motives to be imputed to him.

In my last, I strongly recommended the use of the plough in the cultivation of the sugar cane, and gave you a statement, showing the advantage actually gained by the use of the plough, over the old system of digging cane holes, still too commonly adopted in this island. It is seldom that a fair trial is given to the two systems, and that a comparison can be drawn, as in that instance. It is to be supposed, that finding the advantage derived from the plough, I should no longer continue the old system, even partially. In my subsequent ploughing, therefore, I had no cane pieces to compare them with ; but for the benefit of those anxious to make a trial, I will state the cost of each piece, and allow them to draw their own inferences as to the value of the system proposed.

The first piece ploughed, after the one mentioned in my last, was 11 acres ; ten cattle were used—the land was ploughed entirely over in dry weather, then harrowed with a grubber or scarifier, for want of a regular harrow, and then ploughed into cane holes with a double mould board plough. The cost for the 11 acres was £17 10s. By the common operation of digging, at the rate of 70 holes for 2s., it would have cost for lining off and digging, £44.—To common observation, the saving here shown, is the extent of the benefit usually supposed to be derived from the use of the plough. In my last, however, I showed you how far such was from being the case. In the present instance, I have no other piece to compare the cost with, and must be satisfied with stating, that the plough had so completely got rid of the grass, that the first weeding did not take place till two months after the planting, and then cost only 8s. 8d. per acre.

The next piece was 9 acres—was ploughed with 8 cattle, and cost for ploughing entirely over—harrowing with the grubber, and ploughing the caneholes with a double mould board plough, the sum of £13 17s. By the old method, it would have cost £36.—The next was 13 acres, and was ploughed, as I now continue to do, with six cattle—it was ploughed entirely over—harrowed with the common harrow, then with Kirkwood's grubber, and afterwards ploughed into drills, with a single plough, for planting Guinea grass, not being required for cane cultivation; the expense, however, was as great as if caneholes had been made—the cost was £16 6s. 6d; by the old method, £52. In this last piece, though heavy rains set in almost immediately after the ploughing, no grass appeared in it for 2 or 3 months. The above examples, will, I hope, be sufficient to induce interested parties to make the trial.

It seems surprising, at the first view, that so simple an expedient for the saving of labour should hitherto have been so little used. When it is considered, however, that so many attorneys were formerly possessors of jobbing gangs, the wonder with regard to the non-use of it in the time of slavery and apprenticeship ceases, and the little use of it at the present time, must be attributed to the force of old habit, and the disinclination to be put out of the usual system. That upon the free use of the plough and other agricultural implements, depends the welfare, and in fact the existence of the sugar cultivation of the island, may be made apparent, and I shall do my utmost to show the truth of it.

In the first place, it is generally admitted that there is a great scarcity of labour; in the next place, it is nearly as generally admitted that white immigrants will not succeed on sugar estates, and must be confined to coffee estates and the mountain districts. Blacks from Yankee land will not come here, whilst they can get higher wages in Demerara aud Trinidad; if therefore we are to depend for help upon savages brought from Africa, it is truly trusting to a broken reed; they may in time become useful members of society, but the importation will be attended with much expense, and the result is, to say the best, doubtful; but the use of the plough is open to no such objection; the expense is trifling, the result certain. Every cattle used in the plough saves a large amount of human labour; a man I presume would be considered mad to hire people to carry home canes to the mill on their heads from the field instead of employing cattle and wains; precisely in the same situation stands the man who hires people to dig caneholes when he is able to make the same with a plough; unfortunately, however, public opinion does not yet view it in that light; such however will before long be the case, and posterity will wonder, when informed, that men used formerly to do the work of cattle. What would be thought of an English farmer, if instead of ploughing his land for sowing wheat, he were to hire 50 or 60 labourers to dig drills in a pasture land the same as we do caneholes? and yet the two operations are of precisely similar nature. We shall never prosper till we adopt a more rational system of agriculture.

In my last, I showed you that by the use of the plough, I had effected a saving of nearly two-thirds of the labour usually bestowed upon the plant canes; now, I think that the amount of labour for the cultivation of plants is, generally speaking, about the same as for the cultivation of ratoons; therefore, the saving of labour would be about equivalent to the saving of one-third of the whole field-labour of the estate, that is simply by using the plough for caneholes, without considering how far we may make use of agricultural instruments for cleaning both plants and ratoons. Of course a saving of labour of one-third is equivalent to the introduction of immigrants to the same amount, if the old system of canehole digging is to be followed; and which is the best, to introduce immigrants at great trouble and expense, or to take the equivalent value of their labour by means of cattle and agricultural implements at a small cost and little trouble? If any are inclined to doubt the propriety of buying the necessary cattle, let them consider that for the benefit of the estate dung must be made, and that after cattle have worked some years in the plough, they are still of considerable value to the butcher. If cattle are expensive and unnecessary, why buy them to work in the wain or the mill? why not hire human beings to do the work the same as digging caneholes?

In my next, I will endeavour to show what the prospects of the planter are, and how, under a good system of management, estates may be made profitable, and to compete with slave-grown sugar. It does appear to me that slavery hung like a mill-stone round our necks, and as a curse, blasted all our endeavours in former times, but that now blessings and prosperity will attend our endeavours for the benefit of the Island, if properly conducted.

AGRICOLA.

Amount brought forward	1360	£2740	0	0
Various other things	100			
Commissions	600	2060	0	0
English supplies		500	0	0
Freight of 300 hhds., netting 16 cwt., at King's beam, at 5s. per cwt	£1200 0			
150 puns. (90 galls) at 6d. per gal.	337 10	1537	10	0
	Total	£6837	10	0
300 hhds., at £20 (16 cwt. at 25s)	£6000			
150 Puncheons, at £15	2250			
Rents collected	300			
Sales of old stock, &c.	100	8650	0	0
	Profit	£1812	10	0

I have mentioned the price of sugar at 25s. per cwt. which I consider is the lowest price to which it is likely to fall; I think the price is likely to fluctuate between 25s. and 30s. In January, this year, the *Globe* states, " Since June, the English people having been paying for British West India Muscovado Sugar, of " middling quality, not less than 80s per 112 lbs. duty paid; out of ' which 25s. has been for the Treasury; 25s. has been the value of " Foreign Sugar of equal quality in bond in England, &c."—Again, " Mr. M'Gregor recommends not to *equalize* the duties (be- " tween British and *Foreign* Colonial produce), but to continue a " protecting duty of 8s. per cwt."—25s. being the value of slave grown sugar equal to ours, with a protecting duty of 8s. would make the price 33s.; other accounts mention a protecting duty proposed of 15s., which I think is more likely to be the case, but I wish to calculate on the safe side. Again, the *Globe* states, " Whilst British Sugar has been sold, duty paid, at 85s., or in bond at 60s. per cwt., foreign of equal quality could be had in bond at 25s. or less, &c." Again, " The *Gazette* average price of West India Muscovado Sugar, without the duty, was—

At the end of December, 1829—23s. 3d.
Ditto ' ' 1830—23 4½
Ditto ' ' 1831—22 5½

If we sell at 25s., when the protecting duty is 15s., slave grown sugar must sell at 10s. to compete with us; but it appears by the above extracts, that the value is 25s., the duty would therefore amount to a prohibition. Again, it is well known, that on the reduction of any duty, the consumption is increased more than in proportion to the reduction, and although we may expect a large increase of produce from the East Indies, it is not likely, along with the West India produce, to be more than equal to the demand for home consumption.

If we make as large crops as in 1830, and the price falls to 23s. or 25s. with a duty of 15s. as proposed, the price duty paid being 38s. or 40s., instead of 48s. 4d. (that is 23s. 4d. and 25s. duty) as in 1830, the price being 8s. 4d. less to the consumer than in that year, the consumption ought to be increased in proportion.

With regard to the price of rum, I think the future value of it is very precarious, considering the rapid strides the temperance societies are making; I think, however, £15 a puncheon is a safe estimate.

From the above it will appear, that I anticipate the price of sugar will fall to £20 to £25 a hhd., but that under a judicious system of management, and the proper use of the plough, we may sell it at £20, and clear a fair profit; that the duty is likely to be 30s, on Foreign, and 15s, on Colonial produce, which will act as a prohibition on slave grown sugar, as the demand for the home consumption is likely to be permanently supplied by the East and West Indies combined, and that the increased consumption of produce in Great Britain, will make room for the increased produce of the last, without ruining us, as has been so often anticipated.

AGRICOLA.

ON THE RENT QUESTION.

TO THE EDITOR OF THE ROYAL GAZETTE AND JAMAICA STANDARD.

2ND JUNE, 1841.

I have long wished to see the Rent Question fairly discussed, and as you have started the subject, I wish to state my views. I agree with you altogether in your wish that the labouring population should gradually withdraw from the cultivation of provisions, leaving it entirely to a separate class of people (the small freeholders in the mountain settlements) to cultivate them as a trade, and to supply the markets; our laborers might then be expected to work six days a week, the wife going to market on the Saturday. I think the produce of provision grounds is sadly overrated, and that if the laboring classes would calculate the loss of wages they sustain, whilst working their grounds, the rent of the land, the loss from trespass, robbery, and dry weather, they would find that buying at the market, would not be more expensive. I do all I can to persuade the people in my charge to depend on the market for their provisions, which many of them do; but a great many still like to follow their old system of working a ground, and to them, of course I rent land for the purpose ; I am, however, making arrangements gradually to do away with this system, by giving each family half an acre of garden to their house, and when that is in good cultivation, I shall refuse to rent them any other provision grounds.

I do not exactly understand the nature of the independence you attribute to the laborers: if you mean that there should be an agreement between the proprietor and the people living on the property, that they should work for him whenever he wants them, I deem such a system as equivalent to the apprenticeship system, and to be both highly objectionable, and at the same time quite impracticable ; in such a case the service would be unwillingly performed, the amount of remuneration would always be disputed, and in fact the people would be in the condition of serfs. The labouring classes are becoming too well acquainted with their own interests to be imposed upon, and I do not see that any system can stand, but one based upon justice to them, and that is fair and reasonable to both parties; all the other systems adopted must, I consider, fall to the ground.

The different plans seem to be, first, charging no rent when working on the property, but a high rent when working off; in this case they are generally paid a much lower rate of wages than where rent is regularly charged, thus nominally not paying rent, but in reality paying, what has not been inaptly called, " rent in an invisible shape." Secondly, charging a moderate rent when working at home, and doubling it when away. Thirdly, charging a high weekly rent at all times, without restriction as to work. Fourthly, charging a moderate rent by the year, or leasing, without any restriction as to work. And lastly, selling the houses and gardens outright.

All proprietors have, or ought to have, two objects in view ; first to locate as many labourers as possible, and secondly, to get them to work as cheap as possible. How are these two objects to be obtained ? The first would be best attained by selling them the land, and there are very few estates but what could spare half an acre for each able laborer living on the property. After he had once purchased it, there would be no chance of his leaving again ; never mind whether he turns out a scamp or not, you have got the full value for the land, and have the law to appeal to, if necessary—the same argument will apply to leasing land to the laborers; when once they get a lease they make up their minds to remain stationary, and therefore they may be considered secure. The first and second modes of charging rent, are the cause of so much disputing and ill-will, and are so obnoxious to the people, that they naturally resort to the method of buying their own land; the third mode is also a sure method of driving the labourers sooner or later to buy their own land; I contend, therefore, that the only method of obtaining a resident laboring population, is by either selling them the land, and to this I see no reasonable objection, or granting them a lease, on reasonable terms, without having any understanding or restriction about labour.

Under the first and second methods of charging rent, the object is undoubtedly to force the people to work, and although it may have succeeded hitherto, it will fail as the people become enlightened; the object of the third system, seems to be to take advantage of their having good provision grounds and houses, for which they would rather submit to pay an exorbitant rent, than to be turned out of, thus compelling them to work to pay the rent.—That they have already found out that it is much cheaper to buy their own land than to pay an exorbitant rent, witness the number of small settlers springing up. All plans must fail except the natural one, and the one which acts upon all classes equally, namely, the necessity for supplying their wants. The same that you or I work to supply our wants, they work to supply theirs, and will continue to do so, and all that can be done is to raise them in the scale of civilization, thus increasing their wants, and their desire for money; every person must allow, that there is a great improvement in this respect, since the commencement of freedom—they feed better—they dress better—furnish their houses better—buy horses, &c.—and now that they find the benefit of money, there is no fear of their wants not continuing to increase.

Having thus stated how the laborers may be induced to locate on the estate, I think it will be allowed that you will have a much better chance of obtaining labour than if you are dependent on strangers; if you offer the market price for labour, they will surely all stay and work at home, in preference to walking about the estates looking for work.

There is still a feeling in favor of what they call their own estate. When a man buys two or three acres of land, he is more inclined to cultivate it, however poor the return may be, than to go out looking for employment; but when a man has only a reasonable sized garden, he makes his wages his dependence, instead of cultivating on his own account.

Having now stated the best means for securing the greatest number of laborers, it remains to be shewn how the wages may be reduced, or what amounts to the same thing,—how you may increase your returns from the same amount of labour. The first is, by the use of the plough and agricultural implements, doing the work with cattle, that used to be done by human beings ; secondly, saving labor, by the introduction of machinery at the manufactories, as much as possible ; and lastly, by doing all the work by the job, thus calling forth the greatest energies of the laborers by the hope of " the reward which sweetens labor." Each of these methods, to however trifling an extent adopted, throws some laborers into the market, and has a tendency to bring down the wages, and to make the laborers civil, and anxious to please ; it makes a wonderful difference, whether the laborers are obliged to ask you for work, or whether you are obliged to send and beg them to come and work : in the first instance, you can make a fair bargain ; in the latter, you must pay whatever they choose to ask.

AGRICOLA.

ON THE REPAIRS OF THE PUBLIC ROADS.

TO THE EDITOR OF THE ROYAL GAZETTE AND JAMAICA STANDARD.

JUNE 3RD, 1841.

I am led to suggest a few hints to the parochial authorities of Saint Mary's, on the state of their roads, from having been a spectator, a few days ago, of the way in which one road, not a hundred miles from Port Maria, was being repaired. I passed fourteen people crowded in the space of less than fourteen yards, amusing themselves with occasionally digging a small trench on one side of the road, I presume at two shillings a day wages : the work might easily have been performed by one man with a spade, and I am confident he would do as much for three shillings, or a dollar, as the fourteen people would do for their seven dollars. It reminds me of the old time when the jobbing gangs were given a holiday, by being put to repair the public roads, the said repairs consisting of hauling any soft mud they could find into the middle of the road, hoeing a little grass here and there, and amusing themselves with walking about and looking at the road. Such a system should not be tolerated now-a-days, and there is nothing where the sweeping broom of reform is more wanted, than in the management of the public roads. Saint Mary's must be flush of funds, if the Vestry allow the money to be wasted on the roads in the manner above mentioned.

Not knowing the system adopted in Saint Mary's in the management of the roads, but thinking that nothing can possibly be worse than the state in which they are usually kept, I beg to suggest; First, that the roads should be classed into 1st, 2nd, 3rd, and 4th rates, and that the number of miles in each class of roads should be ascertained, then that an allotment of a certain sum per mile should be put on each class, as in St. George's; secondly, that instead of waywardens, an honorary office should be formed of road inspectors, gentlemen taking an interest in the welfare of the parish, and who would each take a district round his residence, and see that all the roads in that district were repaired, as far as the allotment would allow; for this purpose, the money allotted should be forthcoming, whenever they may require it, according to the number of miles of each class of road. So far to the general arrangement; next as to the best way of laying out the money allotted; I think the best way is to lay out half the money in the temporary, and half inthe permanent repairs of the roads; by the temporary repairs, I mean digging small trenches to draw the water out of the holes formed in the roads, and the best time for this is in wet weather; the round ridging the roads, and most of them being unpaved, this should be done as in many parts of the United States by ploughing them; also the keeping the side trenches clean by hoeing by manual labour: by the permanent repairs, I mean the laying on a hard material such as river gravel or broken stones, always beginning nearest to where the material is obtained, and covering as great an extent of the roads as the funds will allow. In either instance the most economical way of working out the road allotments is by keeping three or four people at regular work at it as a trade; people at regular work will do two or three times as much as strangers unaccustomed to it, either in breaking stones, laying them on, rounding the roads, or hoeing the trenches, but in every instance where they get accustomed to the way in which the work should be done, they should be tasked to it. Each road inspector should be furnished with a light but strong cart adapted for two cattle for carrying gravel, and each estate should find the cattle to work it free of cost for the roads passing through the estate.

If these suggestions are followed, a visible improvement will soon take place in the appearance of the roads. I have only to add that there is abundance of hard materials to be had in all parts of Saint Mary's with less than two miles cartage, and in most parts at a much less distance; and that whenever a hard material is laid on, it should be done in dry weather, and after the road has been properly rounded to throw off stagnant water.

AGRICOLA.

DEMERARA PLANTERSHIP.

TO THE EDITOR OF THE ROYAL GAZETTE AND JAMAICA STANDARD.

Sept. I, 1841.

A friend of mine, long resident in Demerara, but now on a visit to this country, having given me much valuable information with regard to the agriculture of that colony, it has struck me that it may prove interesting to your readers to know some particulars respecting it, more especially on such points as differ from our usual management, and on many of which it appears they are far in advance of us. I have gained many useful hints, and no doubt your readers will do the same.

The chief difference between the two countries is from the one being hilly, the other perfectly level; this of course causes their system of management to be in many respects different from ours. Their first object is to keep the dams in good order to prevent the estate from being overflowed, in the front by the sea, which rises two feet at high spring tides above the level of the land, and at the back by the bush water which in rainy weather would overflow them from the rear. All the estates are laid out on one plan, namely, a slip of land from four to six miles long, and four hundred yards wide, facing the sea. The front dams form one continuous embankment against the sea. Each estate is separated by a dam or mound (thrown up from a trench on each side of the estate for the purpose of draining) and running back in a perfectly straight line to the rear of the estate: all the small drains run into these two main drains, which empty themselves in the sea through a sluice at low water. Parallel to these two draining trenches, and going through the middle of the water, is a canal with branches at regular distances at right angles, for carrying home the canes to the mill in punts. Where the land is so level, it may easily be supposed that a great deal of labour must be necessary to keep the drains sufficiently clean and deep to dry the land; and in practice it is found that the returns from the land are just in proportion to the effectiveness of the drainage. Might not we cultivate the swamps along the sea coast in the same way, only having pumps worked by the wind to draw off the water, as the falling of the tide is so small here ?

The land being so intersected with drains, it is almost impossible to use the plough ; but some parties have lately been attempting it. The usual method of making cane holes is with a shovel or long handled spade ; few cane holes are now dug in consequence of the scarcity of labour, but all the ratoons are supplied every year as soon as they are cut. There is a considerable difficulty in getting labourers sufficient for the field work, and to supply the mill with canes, but none in the works where the machinery is all on a large scale, and every invention used that can save labour and increase the day's work. In the end of slavery, and during the apprenticeship, all the work on the estate was done by task, and only one scale of task work was in use throughout the colony, and here they had the advantage of us, for, at the commencement of freedom, they had only to say, you do us the same work as formerly, and we will give you a certain rate of wages, which appears by one consent to have been fixed at one third of a dollar a-day. The task in the apprenticeship was calculated at seven hours and-a-half work, and six tasks were a week's work, this they still continue, but the people usually perform the six days task in five days. The laborers are usually paid once a month, and are expected to work regularly, except in case of sickness when they are attended by a medical man paid by the estate ; if absent without leave during the month, half a day's wages is deducted at the end of the month for each day's absence. They keep possession of their houses by the month, and are charged no rent for them, or for the provision grounds, except under the circumstances above mentioned. The houses are very comfortable, and far superior to our laborers' cottages ; they are two stories high, shingled, and boarded, and cost £100 for the erection of a double cottage ; two families reside under one roof ; the kitchens which the laborers erect themselves are nearly as good as our labourers' cottages : the people also have valuable provision grounds, and the holding possession of them on this tenure appears to make them work with great regularity. At the expiration of the month, if not satisfied, they can work elsewhere, but must give up possession of house and ground. There are, however, no Baptists to create misunderstanding and confusion between master and servant, and it is not the fashion to apply to the Stipes. The laborers are encouraged to do as much extra work as possible, and this is generally, paid for every day as performed.

The Hill Coolies have answered remarkably well as agricultural laborers, being civil, sober, industrious people.

Many well managed estates made as much in the apprenticeship as in the time of slavery, and are now making two-thirds of their former crops; but most of the estates are on an average making about half.

The proprietors seem to have found out the best methods of making their estates productive, by making the manager also attorney, and in many instances selling him one fourth or one third of the estate, to be paid out of his share of the profits, thus insuring his utmost exertions and attention. The overseer or manager, as called there, is far better paid than here, usually getting from £200 to £400 sterling, for which he feeds himself, but is also allowed a sufficient sum to feed each bookkeeper or white tradesman employed.

The cane is all Bourbon, and the land never manured, being rich enough without; the canes often grow twenty feet long, lodging and running along the ground in all directions; they are never trashed when in this state: all the cultivation they get is, relieving or turning trash, and supplying as soon as possible after cutting; weeding and moulding at six weeks, and again at three months old; and one weeding and trashing when about five months old: after this, they take their chance till cut: when the piece is supplied the trenches are carefully opened and cleaned if the requisite labour can be procured. In relieving, all the trash is invariably put on one row, the other one being left bare for the convenience of moulding the canes; and in former times it used to be shovel ploughed, but labour is now too scarce; next year the trash row is changed, and the one that had the trash this year is kept for moulding. I think this would be a very advisable plan in this country, in fact it is the one I have adopted for ploughing between the cane rows. The task of weeding, moulding, and supplying is 100 rods, of twelve feet four inches, or about four hundred yards; the payment one third of a dollar, or one and four-pence sterling. The canes are cut and carried out to the punt in the canal for 1s. 9d. for a cord fourteen feet long, four feet wide, and four high, the average distance of head carriage being twenty-five yards.

The average return from the canes is, at the present day, about a shipping hogshead an acre.

The Jamaica planter will probably consider his system of field cultivation preferable to the Demerara one, it is a question however worthy of consideration, whether we do not trash our canes too much. Such, however, is not the case in the manufacturing department,—there no expense is spared in making it perfect, and in adopting any machinery to economise labour. Every estate has a steam-engine, and generally of greater power than those used in this country, it is now made to work all the extra machinery for saving labour, and it is found to increase the day's work, and not perceptibly diminish the power of the engine. Every estate now has a cane carrier, for bringing the canes from the canal side to the mill; the canal boat or punt comes under a shed where a few hands are engaged in unloading it, and pulling the canes on the cane-carrier, which is constantly ascending to the mill, and is found to feed the mill much more regularly than when the canes were carried on peoples' heads, in the old system; the shed protects the people from the weather, The liquor from the mill is pumped or elevated by machinery of different constructions to the boiling-house. The trash is elevated by machinery to the railway, when it is thrown into a light cart, and a couple of boys are employed to shove it along to the trash-house, and upset it where required.—Children and elderly females are generally employed carrying the dry trash to the stokehole, and often in unloading the punts, the strong hands being employed in the field. The regular work for one set of coppers, when the mill is well supplied with canes, is from two and-a-half to three hogsheads a-day, and always boiled off in day light; when two setts of coppers are at work, or one sett with two teaches, from five to six hogsheads a day, Here it is that we are chiefly excelled, and it will naturally be asked how they are so far in advance of us. Few of our coppers make more than one and-a-half hogsheads in daylight, although our liquor is far richer than theirs, we taking, I should say, an average of from 1,800 to 2,000 gallons to a hogshead, whilst they seldom average less than 2,500.—Their coppers are hung on a different plan from ours, every part of the surface being as much exposed to the fire as possible, but the chief cause appears to be in the size of their chimneys which are usually from 80 to 110 feet high, and very capacious, being 4 or 5 feet square in the inside of the flue at the bottom, which causes an intense draught. The clarifiers are usually hung to separate fires, but I think our plan preferable, and in lieu of the clarifier they place a spare boiler to be heated by the waste fire from the coppers, the steam from which often supplies the engine after the coppers are fairly about without using the one attached to the mill, or at any rate with only a trifling fire being kept under it. From the rapid boiling of the coppers, the estates have a great abundance of trash, often sufficient to boil 100 hogsheads, and they use it both for the still and engine; how differently situated are we, from our slow boiling we are generally very deficient in dry trash without using it for any purpose but the stoke-hole, although from the superior richness of the liquor we ought to have it in greater abundance. The rapid boiling also causes the quality of the sugar to be very good. Almost all the estates use a dipper for striking the skip instead of taking it off with ladles, by which means, nearly an hour a day is saved,—the fire not being stopt to clean out the whole till three skips are struck. Immediately, on the dipper being hoisted out of the teache, a flood gate is raised in the saddle between the first and second teache, and the liquor flows in : the dipper is a light copper vessel made to the same shape with the teache, with a valve at the bottom, by which it fills itself when lowered in the teache ; it is then hoisted by a small winch, and the weight of the liquor shuts the valve : the dipper is hoisted as high as necessary ; a gutter placed underneath, and the syrup runs to the coolers. These are sometimes placed in a kind of upper story of the curing-house, so that when the sugar is to be potted, it is thrown by a long-handled shovel into a moveable wooden spout, and slides down to any hogshead in the curing house, thus obviating the necessity of carrying sugar on the head in pails, as here : on other estates, each skip is sent from the dipper in a small waggon, along a railway, to the curing house. These plans might be used to advantage on many estates here. The sugar is now usually potted quite cold, many coolers being used, to allow it plenty of time to cool ; they find it increase the size of the grain materially, and it prevents the sugar running though the bottom of the cask with the molasses. Many estates only pot twice a week. The quantity of molasses usually got from a hogshead of sugar (40 inches truss) is from 60 to 70 gallons, imperial.

In Rum crops, they are far ahead of us : two puncheons, from three hogsheads, being considered a small return : the quality of the rum is usually very good. Uncommon attention is paid to keeping every thing perfectly clean, the mixing cistern being washed every day, and the vats every time they are used. Dunder or lees also is seldom used. The best returns are got from liquor set very low, say 9 to 10 per cent of sweets, that is, including both molasses and skimmings.

I have now gone through the common process of making sugar, but as many of the estates have lately got vacuum pans, and as, from their success, most of the others are ordering them, the proprietors and planters of this Island may be glad of some information concerning them ; they ought by all means to keep pace with other colonies in improvements.

A proprietor who manages his own estate, adopts the following plan ; he first racks the liquor in the clarifiers, by a separate fire, then brings it down into the copper wall, where he has only three large sugar pans or coppers, each containing from 4 to 500 gallons, here he completes the cleaning of it ; he then charges it with a ladle or dipper, into a small teache, which is sunk in the wall close by, but no fire plays round it : in this teache is a long iron pipe, connected with a force pump, worked by the engine, through which the liquor passes into a large receiver above, and connected by a cock, with the vacuum pan. The reason of the teache being unconnected with the rest of the coppers, is that it may allow the steam to escape from the boiling liquor previous to its being pumped up, no pump being able to act upon steam, until condensed, on account of its elasticity and expansive power.— The vacuum pan process usually has a boiler on the flue of the copper wall for supplying steam, both to work the vacuum pan, and also to assist the engine boiler; the two boilers generally communicate, so that either one can work the vacuum pan.

The pan is a copper vessel, the lower part of which is double cased; which case is filled with steam, at the same time that the air pump causes a vacuum in the inner vessel: this vacuum causes the liquor to boil at a very low temperature and very quickly, so that the liquor does not become discoloured or charred, as in the common process. Vacuum pan sugar is of a beautiful clear color, and in large chrystals, like sugar candy. In emptying the vacuum pan, the cock communicating with the air pump is stopped, so as to allow the liquor to run out at the bottom. Some people instead of pumping the liquor into the receiver above the pan, place the receiver low down on the ground, and the vacuum made by the working of the air pump, draws up the liquor when required, by the opening of the cock. This pan is boiled once a day, and holds from 2 and a-half to 3 hhds.; it usually takes about ten hours.— When the strike is up, or skip ready, the thermometer indicates a heat of about 160 deg. It is a well ascertained fact, that a larger proportion of sugar, and less of molasses, are extracted from a given quantity of liquor than by the old process. It likewise appears, that when sugar at home is high in price, the brown vacuum pan sugar is most profitable; when on the contrary sugar is low in the market, the white pays best. The difference in the process of making brown or white vacuum pan sugar, consists in this, namely, the brown is the sugar, as potted in the hogsheads direct from the pan into cast iron coolers, the bottoms of which are made of iron bars covered with brass wire web, and connected with a pneumatic pump; hot liquor is now put over it from the rose of a watering can, and the air being pumped from under, the molasses comes away at once, and renders it fit for immediate shipment; ten minutes are sufficient for the pump to extract all the molasses; the brown takes two or three days to cure. The white sugar is the very beau ideal of perfection in the art of sugar making, it is like refined sugar pounded.

The latest improvement in the process, is the introduction of a copper worm into the pan for the passage of steam through it, in addition to the outside steam case, by which means nearly double the work can be done, the pan being worked twice a day.—An Engineer, resident there, says, that when there is a good vacuum in the pan, the barometer stands at 27 deg. and the thermometer at 150 to 156 deg. He recommends having the copper pipes or worms for the transmission of steam through the interior of the vacuum pan, fastened at home before being sent out, on account of the difficulty of making good joints here.

The pneumatic pumps have been tried with muscovado sugar, but they were a decided failure, the grain not being strong enough the sugar was sucked through the wire web along with the molasses.

The value of vacuum pan sugar is 1s. 6d. a cwt. more than sugar of a similar colour made in the common way. The great advantage however is gained in the weight delivered at the King's beam, whilst Muscovado loses 10 per cent. on the passage home: vacuum pan sugar does not lose any whatever, but rather gains in weight.

Why should not we convert one of our clarifiers into a vacuum pan, making it boil by the waste fire from the coppers? As only a temperature of 150 to 160 deg. is required, we could easily do it.—The remaining clarifiers might yaw the liquor the same as before, it would then be drawn down into the coppers and perfectly cleaned, thrown by a dipper or ladles into a reservoir from the teache, and sucked up when necessary into the vacuum pan; the air pump, where there is no engine, to be worked by the water wheel; the syrup would run from the vacuum pan through a gutter to the coolers where they are now placed. The clarifiers usually boil half an hour after being filled, unless the damper is lowered, and must therefore heat to 212 deg. Why then should they not work as well as those heated by steam?

AGRICOLA.

ON PLOUGHING HILLY LAND.

TO THE EDITOR OF THE JAMAICA STANDARD.

Nov. 8, 1841.

As the use of the Plough is gradually and steadily increasing in the preparation of land for plants on level estates, and as all those using it with whom I have conversed are satisfied of the great benefit to be derived from it, I need not again recommend it; before long, those who still continue to dig, will find themselves so laughed at, that they will, nolens volens, be obliged to come into the new system.

For the benefit of those however, who are anxious to commence ploughing their hilly land, it may be as well to state how far I have been successful in accomplishing it, and give them the benefit of my experience. The plough must gradually, even on hilly estates, supercede the use of the hoe in making cane holes, except on stony land, as on account of the fall in the price of produce, the present *expensive system cannot be afforded.* In the first place the land must be close ploughed; this, of course, is a more expensive operation than ploughing level land, as the plough goes full one way, and comes back empty. I tried a piece on purpose to ascertain the best method, for it was a new subject to me; it contained 2 acres, and one part of it was very steep; I, however, managed to close plough the whole of it; the cost of it was £13 16s.; but from not being able to look after the people closely, it cost more than it should have done; I also had to try several ways of ploughing, before I found out the one that answered best and fatigued the cattle least. I began in the easiest part of the hill, and ploughed straight up and down. I soon found that the pull up hill, even in the easy part, was too much for the cattle; I then ploughed directly down hill, and took the plough up empty; this did not succeed well, for besides the fatigue to the cattle pulling the empty plough up the steep hill, the cattle run so fast down again, that the ploughman had no controul over them, and could not guide the plough. Finding this fail, I thought I would plough it horizontally, following the winding of the hill, keeping a dead level, and throwing the earth down hill; this would have made the return of the empty plough along the furrow a very easy draught for the cattle. The first furrow in the hard soil succeeded pretty well; after the first furrow, however, the plough kept sliding down the hill, and the ploughman could not make it take land as it is called. I then tried the following method, which I found succeed perfectly, even in the steepest part. Instead of trying to take it along horizontally, I took the plough sideways along the hill, but also a little sloping downwards, just as much downwards as I found would make the plough take the land; the more nearly the plough is kept to the horizontal line, the easier the return of the cattle will be, but a certain inclination downwards is necessary, and the steeper the hill, the more the inclination will be. A ploughman with the plough in his hand, will very soon find how much is necessary for the purpose; at least I had no difficulty in ascertaining it in this case. In this way I succeeded in finishing the job to my satisfaction, and I am not very easily pleased in these matters. I performed the work, as usual, with six cattle. It was a black ploughman employed, who knows nothing more than to keep the plough going in the same way that he is shown at starting.

The harrowing was a simple operation, and cost £2 5s. 0d.

So far all was satisfactory. I had got rid of all the grass, and had my land in fine tilth; but how to make the cane hole, there was the rub! I must frankly acknowledge I tried, and did not succeed to my satisfaction. I tried to make parallel rows with a single plough, along the hill in a horizontal direction, but the soil was so well pulverised, that it ran down and partially filled up the hole as soon as made. You will say the soil was in beautiful order for planting canes, and that the holes might be opened with a hoe. So they might; but that is not sufficient to satisfy my taste. I like nothing short of perfection: at best it would be but a bungling way of finishing the job, besides the expense; I was fairly floored; as the piece was wanted for planting guinea grass, and the holes answered well enough for that, I did not attempt any other method of making cane holes. Since then I have had no occasion of ploughing hilly land. I do not, however, by any means give up the expectation of being able to make the cane holes. The method I mean to adopt next time, is to take a double plough, and make cane holes directly down the hill, spreading only from the crown of the hill in all directions like the rays of the sun. Some impatient men will here exclaim,—"you boobie, all the earth will wash away the first heavy rain!"—not so fast, sir. In planting it, I would put a stop every four or five feet, and make a bar across, which on account of the looseness of the soil would be easily done, thus forming a chequer hole. This occurs to me as the best method to be adopted; I have mentioned it to some other parties who are interested in encouraging the ploughing of hilly land, and they think it will succeed; some, however, of your readers may have found out a successful method of performing the operation; if so I hope they will be kind enough to inform the public.

The close ploughing of hilly land should not be put off on account of our not having yet succeeded in ploughing cane holes; remember what I proved before, that an immense advantage was gained by having less weeding to perform, and also by a large increase in the return. Supposing the piece to be dug after close ploughing and harrowing, the soil is so fine and loose, that a man ought to dig at least twice the quantity of holes; one third or one fourth of the tops commonly used will be sufficient for planting it; the tops will all grow in dry weather: the labor of cleaning the canes will be far less, and the return much greater; these considerations ought surely to be a sufficient inducement for trying the plan.

I think the preparation of the land for planting may now be considered to be placed on a satisfactory footing.

In my next, I will give you my ideas on the proper width of cane holes, a point on which I think the present practice quite wrong.

AGRICOLA.

ON THE PROPER WIDTH OF CANE HOLES.

Nov. 4th, 1841.

TO THE EDITOR OF THE JAMAICA STANDARD.

In my last I stated that I considered the practice with regard to the width of cane holes totally wrong. It has originated from the idea which nobody seems to have taken the trouble to investigate, that the cane has only a very short root. Porter, on the sugar cane, a standard work for the guidance of young planters, says, "The roots are very slender and almost cylindrical; they are never more than a foot in length; a few short fibres appear in their extremities." I have often discussed the matter with planters, but never found one who would allow that they had much more than what Porter mentions. Consider the matter: how is it possible for such a small root to maintain such a large plant?— Why should the cane be an exception to the general rule, that the roots of a plant or tree extend as far below ground, and all around, as the branches and leaves do above? Tull, the father of the horse-hoeing husbandry, proves that the lateral roots of a turnip spread upwards of three feet each side, although, on pulling it out of the ground, you would suppose they were not three inches long. The roots of wheat have been proved to be six feet long. In digging post holes for a cattle pen, on a thrown up cane piece, I have found abundance of strong cane roots, running in all directions, in a stiff cold clay, two feet perpendicular below the surface. In transplanting some young plants, about six or eight weeks old, I pulled up some roots fully three feet long; they must have been much longer, but the fine ends were broken off by being roughly pulled out of the ground. One of the strongest proofs of the extent to which roots will run, is in the fustic tree; the root is recognised immediately by its colour; where there was only one tree in the pasture, and that a small one, I found them at an immense distance, I should say seventy or eighty yards.

From the above specimens, it will be seen that roots extend much farther than is commonly supposed. I consider the roots of a full grown cane extend at least ten feet in every direction. Now, in the common four feet, or four and a half feet cane hole, what room has the root to extend, and how can it in such a confined space find nourishment sufficient to bring the canes to their full perfection? I consider eight feet is the nearest distance at which the rows should be made in ploughed land; for, besides the advantage that it gives you of cultivating the canes with agricultural implements, it is necessary for allowing the cane roots to find food sufficient to nourish the plant, and bring it to maturity. Is it better to have one row of strong healthy plants, or two rows of puny weakly canes?—and which are the more likely to rattoon vigorously? I have founded this opinion from attentive observations of the cane; I find in my old rattoon pieces, that the canes have to a great extent thinned themselves out; the more vigorous canes have robbed their neighbours of nourishment, till they have dwindled away and died. Wherever there are large luxuriant canes, the alternate rows are dead. Following the common practice, I used to supply them, thinking to increase the return from the cane piece; I found, however, upon examination, that it was labour in vain; the supplies struggled for existence, but never came to anything, unless the space was very large—say eight or ten feet each way; I now never attempt to supply, unless the space is that size, and then put in only one supply. I find no falling off whatever in the pieces, although the canes grow so irregularly; the few large canes giving me as much sugar as the many small ones. If, therefore, as large a return can be got from eight feet rows in rattoons, why should it not be adopted in plants? It will allow the canes to be cleaned by agricultural implements, instead of the expensive mode of manual labour.—The same as turnips and green crops, are horsehoed at home, we may clean our plants here. I have made several attempts at tillage, between the young plants, but using cattle working abreast for the implements, I found the thing impossible at the usual distance. I then extended my cane holes to six feet, and found even that not sufficient. The six feet rows covered the ground as completely as four feet rows, and gave as good returns. I have not yet had an opportunity of ploughing eight feet rows, but in planting a piece of new woodland, I left the cane rows ten feet wide, and the return from them has been as great as it would have been at four feet. The stumps prevented my using the plough or horse hoe.

The advantages therefore in planting at eight feet wide would be, that the canes could be cleaned by agricultural implements, thus saving manual labor; the return would be at least equal in quantity of sugar; and the stools would be more vigorous and hardy in rattoons.

I recommend this as a part of a system of cultivation worthy of the name of agriculture, which I shall shortly bring before your notice, in the management of rattoons. Here it is that the want of a practicable system of agriculture is felt. It is universally admitted, that rattoons give the best quality of sugar, and that they are by far the cheapest to cultivate. Such is the case, and therefore it is that I have hitherto been most anxious to perfect their cultivation.

I have just completed a system which I believe will be found perfect; it will enable every estate, except on stony land, to double its crop without putting in an additional acre of land; it is founded on true principles, theory and practice combined: it will before long supersede every other system of management: and, as a matter of course, else I should be the last to recommend it, it will save manual labour, and reduce the cost of production. It is simplicity itself, and like Columbus's egg, everybody can make it stand on end when shown how.

AGRICOLA.

ON RATTOON CULTIVATION!

"He who makes two blades of grass grow where only one grew before, is a benefactor of mankind."

"Whoever strives at excellence, will be above mediocrity, and whoever is satisfied with mediocrity, will fall short of it."

TO THE EDITOR OF THE JAMAICA STANDARD.

In my last, I recommended that all canes should be planted in rows eight feet apart, both for the sake of cultivating them with agricultural implements, and also as it would suit the system of cultivating rattoons, which I now bring forward.

Canes are now all planted at four feet—four and a half feet, and some few at five feet. The system, I propose, is to plough up every second row, leaving them from eight to nine feet apart.—I showed in my last, that rattoons, under the common method, thin themselves out, in many cases to eight feet apart, and that under those circumstances, the return was as great as if they were only four feet apart, although they got no cultivation, except hoeing in the usual way; how much better, does it stand to reason, must they yield, when the interval between the rows is completely close ploughed, and the rotten trash turned in. I have tried the common plough, and three or four kind of horse hoes amongst rattoons growing in the common way, and found it impossible to do any good with them. Moulding with a double mould board plough I never attempted, because I think it very absurd, and only mention it as some parties may call it rattoon cultivation.

When I had come thus far in arranging my system, I had intended to put all the trash on every second row and fallow the other, which would have been an immense improvement on the old system; the second year the rows would have been changed, and the one that had the trash the first year, would be ploughed the second year.

Getting at this time a work on Chemistry, as applied to agriculture, and treating of manure and the food of plants, I found from it that the trash could by a different application be made a most powerful manure: I found that plants live chiefly on the gases which escape from animal and vegetable substances undergoing a state of decay; that by decaying in the ground the whole of these gases are absorbed by the soil, and taken up by the roots of the plants for nourishment; on the other hand, that when they rot in the air, the greater part is totally lost. Here then it appeared I had a most powerful manure, and in large quantities, for the weight of long tops and trash on a square yard of land is very great; but how to apply it to the soil was the question. If I could apply it to the soil, I could then plough both rows every year, which also would be a great benefit. But to get it into the soil, there was the difficulty. I found that on the Continent several poor cottagers, unable to buy manure for their vineyards, had taken the trimmings of the vine in their green state, chopped them up small, buried them round their vines, and got most enormous returns in consequence. I immediately saw the applicability of it in the present instance, and decided on adopting it; nothing more was necessary than to put one of our cane top cutting machines on wheels, begin at one side of the cane piece as soon after cutting as possible, and chop all the green and dry trash on the row, the plough would then cover it in with the greatest facility. I find both in theory and practice such a proceeding is justified by all my agricultural works, and therefore decided on adopting it.

In justification of the proceeding, and for the satisfaction of all parties, I give the following extracts :—

"*Organic Chemistry in its application to Agriculture and Physiology.*" By J. Liebig.

"ON A MODE OF MANURING VINES.—The observations in the following pages should be extensively known, because they furnish a remarkable proof of the principles which have been stated in the preceding part of the work. They prove that a vineyard may be maintained in fertility without the application of animal matters, when the leaves and branches pruned from the vines are cut into small pieces and used as manure. According to the first of these statements, both of which merit complete confidence, the perfect fruitfulness of a vineyard has been maintained in this manner for eight years, and according to the second statement, for ten years." First example. "I cannot omit the opportunity of again calling the public attention to the fact, that nothing more is necessary for the manure of a vineyard, than the branches which are cut from the vines themselves. My vineyard has been manured in this way for eight years, without receiving any other kind of manure, and yet more beautiful and richly laden vines could scarcely be pointed out. I formerly followed the method usually practised in this district, and was obliged in consequence to purchase manure to a large amount. This is now entirely saved, and my land is in excellent condition. When I see the fatiguing labour used in the manuring of vineyards—horses and men toiling up the mountains with unnecessary materials—I feel inclined to say to all, come to my vineyard and see how a bountiful Creator has provided that vines shall manure themselves, like the trees in a forest, and even better than they! The foliage falls from the trees in a forest, only when they are withered; and they lie for years before they decay —but the branches are pruned from the vine in the end of July, or begining of August, whilst still fresh and moist. If they are then cut in small pieces and mixed with the earth, they undergo putrefaction so perfectly, that, as I have learned by experience, at the end of four weeks not the smallest trace of them can be found."

How beautiful a system!—how applicable to cane cultivation!—"Come to my cane piece, and see how a bountiful Creator has provided that canes shall manure themselves,"—you may fancy the exclamation of the successful cultivator.

Second example. "I remember that twenty years ago, a man called Peter Muller had a vineyard here, which he manured with the branches pruned from the vines, and continued this practice for thirty years. His way of applying them was to hoe them into the soil, after having cut them into small pieces. His vineyard was always in a thriving condition, so much so indeed, that the peasants here speak of it to this day, wondering that old Muller had so good a vineyard, and yet used no manure."

Third example. "For the last ten years I have been unable to place dung on my vineyard, because I am poor and can buy none. But I was very unwilling to allow my vines to decay, as they are my only source of support in my old age; and I have often walked very anxiously amongst them, without knowing what I should do. At last my necessities became greater, which made me more attentive, so that I remarked that the grass was longer on some spots where the branches of the vine fell than on those on which there were none. So I thought upon the matter, and then said to myself: if these branches can make the grass large, strong, and green, they must also be able to make my plants grow better and become strong and green. I dug therefore my vineyard as deep as if I would put dung into it, and cut the branches into pieces, placing them in the holes and covering them with earth. In a year I had the very great satisfaction to see my barren vineyard become quite beautiful. This plan I continued every year, and now my vines grow splendidly, and remain the whole summer green, even in the greatest heat. All my neighbours wonder very much how my vineyard is so rich, and that I obtain so many grapes from it, and yet they all know that I have put no dung on it for ten years."

And what man would not rejoice, after so simple and inexpensive an operation, to see his barren cane pieces become again quite beautiful, and remain the whole summer green!

You remark, Liebig brings this account forward as a striking proof of the correctness of the principles he has laid down.

Lowe's Agriculture. "An example of the application of vegetable substances, in this state, (that is without animal manures) is when certain plants are allowed to come into flower, and are then ploughed down in their green state, and mixed with the matter of the soil. Vegetable matter, when thus covered by the soil in its green and succulent state, readily undergoes decomposition, and forms a very enriching substance. The practice, however, is chiefly suited to the warm countries where vegetation is rapid. In colder countries, where we are able to raise green food of any kind, it is better that we apply it in the first place to the feeding of animals, for then it not only yields manure, but performs the no less important purpose of affording food."

Mark that, "the practice is chiefly suited to the warmer countries." So much for chopping the green succulent tops for manure. I am also prepared to show the advantage of chopping up the dry trash.

Sir Humphrey Davy's Agricultural Chymistry. "Whoever will refer to the simplest principles of chemistry cannot entertain a doubt on the subject. As soon as the dung begins to decompose, it throws off its volatile parts, which are the most valuable and most efficient. *Dry straw* of wheat, oats, barley, beans, and peas, and spoiled hay, or any other similar kind of dry vegetable matter, is, in all cases, useful manure."

As my system is partially opposed to the green crop system or rotation of crops, which is supposed to prove that similar crops cannot be cultivated for years in succession, I must satisfy the public mind on this point. In England there is no crop analagous to canes, there is no crop where the system recommended by me could be adopted, else no doubt it would have been long ago.—There, all the crops, or nearly all, are annual; they must have rotten dung to force the seedlings quickly out of the ground, and nourish them in their youth; they cannot wait patiently for the slow, on account of the cold, decomposition of vegetable matter in the soil: a crop kept back a week or two might be ruined in the harvest. Sir Humphrey Davy's system of unfermented dung was not disputed in theory, but could not be adopted to advantage in practice. Again—in the crops of England every part of the crop is carried off the land, whilst we only take half. Liebig proves that plants are chiefly nourished by the gases contained in the atmosphere and water; that they really take very little from the soil except the manure: that, if the whole of the vegetable matter were returned to the soil, it would be much richer than before, inasmuch as that the nourishment derived from the atmosphere, and water would be a clear increase of manure. By returning half of the vegetable matter of the cane, we may therefore expect to keep the land in heart. He proves also that all vegetables in a state of growth appropriate, the same as living animals, that part of the nourishment they obtain suitable to their condition, and reject the refuse in the shape of excrements in the soil. When a plant has been any time growing in the same situation, the excrements increase so much that it dwindles away: a plant however of a different description will thrive in the spot where the other languishes away, for as the formation of plants is different, so is the food necessary to perfect that formation different: after some time, however, the excrements decompose, and then the same plant can be grown again to advantage. This is the origin of the rotation of crops. Liebig, however, proves that ploughing and exposure to the atmosphere, will very quickly decompose these excrementitious matters; and hence the benefit of the summer fallow. Tull, in his Horse-hoeing Husbandry, proves that he can grow wheat year after year in succession, simply by constantly ploughing the land.

These considerations show that we shall be able, by ploughing between the canes, to convert their excrements into nourishment, and prevent the gradual deterioration of the cane as is now experienced in the case of rattoons. The great advantage of the green crop system is that it gives such an abundance of food for their stock, which after nourishing their cattle, is fermented in their dung-heaps and applied in a rotten state to force up a rapid vegetation in their profitable crops, the corn crops. We, having only one crop, must adopt a different system. As the plough was unused in the old times, and therefore the benefit of summer fallowing unknown, the next best system was to allow the land to rest, and cultivate another part of the estate, which was accordingly done. I think I have fully proved that such a system is perfectly unnecessary, and the best possible system is the one recommended.

I will shortly compare the two systems, which will show the advantages the one has over the other. There are two estates, next door neighbours, each at present with a hundred acres of canes in, which we will suppose all close to the works, and making 100 hogsheads; it is wished to raise the crops to 200. The one annually cultivates a part of the canes in the way recommended until the whole field is under the system, when the hundred acres will yield two hundred hogsheads. On the other, land must annually be sought farther away from the works, and ploughed or dug until there are two hundred acres in to make the crop wished of two hundred hogsheads. Here several things are apparent ; the carriage of the canes is increased ; there is a much larger quantity of land to be protected from trespass ; and the cleaning of the canes is much more expensive. On the first estate the great bulk of the cleaning will be done by cattte and agricultural implements, and there will only be one hundred acres to be kept in order. On the last estate the two hundred acres must be entirely cleaned by manual labour. On the first estate there is no starving of the cattle in pens at night, the fertile source of mortality generally called dying of *consumption*, but more properly speaking of *non-consumption* ; the field not requiring to be increased, there is no occasion for manuring the land in the common way, the cattle would therefore be turned into the pastures at night, and in the morning would be ready for a hard day's work. The saving in the item of cattle alone would be very great. Mind I don't object to the land being manured if more canes are to be put in ; let that be distinctly understood—all that I contend for is, that after the plants are established, I can keep them yielding as great a return annually as they did in plants.

On those hilly estates where it is not possible to plough between the canes, spade husbandry must be adopted. Hilly estates under any circumstances are more difficult to manage than level ones ; the plan however will be, to keep the canes all round the works ; to close plough the land as a preparation for plants, and make chequer holes about six feet apart in the way recommended in my last letter ; then annually to chop up the long tops and trash with sharp cutlasses and bury them by digging with spades between the rows. In their present rattoons to dig up every second row, and bury the trash.

I think I have now fully redeemed my promise of laying before the public a system of agriculture adapted to cane cultivation and founded on true principles. I should wish every estate in the island to give it a fair trial. It may meet with opposition from prejudiced parties, but I confidently predict its shortly becoming the only system of cultivation.

AGRICOLA.

ON AGRICULTURAL SOCIETIES.

To His Excellency Sir Charles T. Metcalfe, as Patron of all the Agricultural Societies in the Island.

15th November 1841.

As it is well known that every thing that conduces to the agricultural prosperity of the Colony meets with your warmest support and encouragement, and as it is the duty of every man to do what he can for the benefit of his country, I am induced to offer some hints to the Agricultural Societies which you have so kindly patronised, hoping thereby to extend the sphere of their influence and benefits; and, at the same time, to induce parties who are now lukewarm on the subject, from not being aware of the advantages they confer, to come forward and support them both for their own benefit, and for that of the agricultural interest generally.

Struggling as we are with no common difficulties, this is not the time for lukewarmness on subjects of such vital interest. I feel confident that the matter needs only to be fully explained to be duly appreciated, I shall therefore endeavour to the best of my humble abilities, to show how they will benefit the proprietor, the attorney, the overseer, the bookkeeper, and the labourer. When I have shown that, I think I can fairly appeal to their pockets for due encouragement and support.

The societies, as far as can be judged from their advertisements and lists of prizes, appear anxious to improve the agriculture of the Island, but none of them, as far as I have seen, go half far enough in the matter, chiefly confining their prizes for the encouragement of sugar cultivation, and to which point I shall entirely confine myself, to ploughing matches, and exhibitions of stock: now, these objects ought to meet with encouragement; but there are many others also, which would greatly tend to develop the latent energies and abilities of the planters.—I will briefly mention what chiefly appear to me the most necessary objects, and the most deserving of support, and for the encouragement of which I would offer the following prizes:—

To the overseer who shall introduce the best method of saving manual labour in the field cultivation by the introduction of agricultural implements, or any other method, a handsome prize—say £10 or £20.

To the overseer who shall introduce the best method of saving manual labour at the mill or manufactory, by the introduction of machinery, &c.

To the overseer who shall make the largest sugar crop, in proportion to the quantity of land in canes; to be reckoned from 28th of September to 28th of September.

To the overseer or book-keeper who shall introduce the best method of improving the quality of sugar.

To the overseer or book-keeper who shall introduce the best method of improving the quality of rum.

To the book-keeper who shall make the largest rum crop in proportion to the quantity of sweets used, and according to the strength of the rum: to be reckoned from the 28th of September to 28th September.

In each case a handsome prize of £10 or £20.

Each competitor for these prizes to send a detailed account of the method adopted, to be publicly read before the prizes are adjudicated.

The prizes should be adjudicated at the last quarterly meeting of the year, after the sugar and rum returns have been given in—when of course, there would be a full attendance of members, from the interest excited by the competition for so many prizes. There are few things more exciting than to hear our own communications read publicly before our fellow-associates.

Supposing these prizes to be offered annually, the last meeting of each year would become one of intense interest.

From the perusal of the above prizes, it is very evident how largely the proprietors of the estates would benefit;—they would naturally, therefore, become subscribers to the funds. According to the increase of the crops, the Attorneys would also benefit in their commissions, besides the honor that would attach to them. Overseers and book-keepers would have a double interest, for besides the remuneration of a handsome prize, they must hope and look forward to becoming Attorneys themselves; and what could bring them more favorably before the notice of the proprietors of the parish in which they reside, than seeing their names honourably mentioned in the yearly printed proceedings of the Society. For each year, a full report should be printed, and a copy delivered to each member.

The prizes for the benefit of the labouring classes, should be distributed at the ploughing match, when the successful ploughmen would be rewarded in the presence of their associates; the head boilermen also for their specimens of sugar; the cattlemen for their working cattle in the best condition, and so forth; thus exciting a laudable ambition amongst the strength of all countries—the laboring classes.

If such prizes were offered, funds would flow in fast enough. The proprietor of each estate would willingly subscribe say, two pounds, the attorney one for each estate in his charge, the overseer one, the parish fifty, and the island fifty, which would form a large fund and be amply sufficient.

Improvement would advance with rapid strides, and wealth and happiness would ere long become the lot of all classes under the influence of your Excellency's paternal government.

Your Excellency will, I am sure, pardon the freedom I have taken in addressing the above hints on Agricultural Societies to you as their Patron, instead of to the public generally. I have done it in the hopes of attracting more general attention to them, and also knowing that you are willing to forward anything conducive to the general welfare.

I have the honor, to be, &c. &c.

AGRICOLA.

PART 2nd.

DISTILLATION.

TO THE EDITOR OF THE JAMAICA STANDARD

October 20th, 1841.

Not seeing any notice of the letter of Etonian in your paper, I beg to call your attention to it; if you can find room, I would advise you to publish it for the benefit of your planting friends. I assure you it has made quite a sensation among us, generally, not easily excited planters. I was asked by so many what I thought of the letter, thas I was obliged, a couple of days ago, to borrow a paper to see it.

At first I was inclined to think that the gentleman had either deceived himself, or had been so by somebody else; in fact, I did not think it was possible to get the return he stated. I have since carefully studied the subject, and find it quite practicable, so cannot doubt his having done so.

Etonian deserves the greatest credit for having shown us what we can do by good management and skill in the still house; he, however, recommends us to carry the matter too far, which it would be, if we were to convert the cane juice into rum. I should strongly recommend planters not by any means to do so, but to confine their exertions to the legitimate object of making the largest returns possible from the means they at present possess. If estates generally were to convert a part of their sugar crop into rum, the price would fall so low as not to remunerate. In Demerara, where distillation is carried on much more successfully than here, the price of rum is so low, owing to the large crops, that it often pays them better to sell the molasses in the raw state. One estate, there, last year, made 500 puns. from 560 hhds., but a part of the cane juice was turned into rum. Let planters therefore confine themselves to making the largest returns they can from the molasses and skimmings they are at present in the habit of using. Any increase then must be clear profit.

ETONIAN is not altogether right in his description of boiling sugar,—the work is not left to the negroes, but the overseer directs the quantity of temper to be given in the clarifier, generally two-thirds of what he supposes requisite ; when the liquor comes to the second or first teache, the remainder of the temper is given ; the quantity is known both by the colour of the froth in the second teache, and also from the way the liquor cuts, (as the negroes call it) in the teache, when it boils down the first time.—The head boiler is then directed to boil high or boil low, according to the overseer's judgment. After the skip cools, if the overseer is satisfied with the appearance and grain of the sugar, he directs the head boiler to continue the same quantity of temper, and to boil the same way. In practice there cannot be much improvement made here, that is, supposing the people strain and clean the liquor as they ought, the overseer and boilers making the most of the means they possess ; but there is great room for improvement in the furnace and hanging of the coppers, which ought to do the work in less than half the time they do at present. The sugar would be improved accordingly. I only want to show that overseers are not, in the boiling department, to blame for not getting as large a proportion, and as good a quality of sugar, as a chymist would expect from the richness of the liquor.

According to Dutrone's Table, the liquor operated upon by ETONIAN, of 1077 specific gravity, contains 19 per cent of sugar, and therefore 2000 gallons, which he estimates, (and which is commonly calculated,) equal to 13 cwt. of sugar, should yield, at the rate of 19 lbs. in the 100 lbs., (or 10 gallons), 3,800 lbs. of sugar. Suppose in the common process you obtain 2000 lbs., the remainder would be sweets equivalent to 1800 lbs. sugar. By the rule that a pound of sugar is resolved during fermentation into half a pound of carbonic acid gas, and half a pound of pure alcohol, which half pound of pure alcohol is equal to a pound of proof spirit, 1800 lbs. sweets should, if the process of fermentation and distillation be perfect, yield 1800 lbs. of proof spirit, or, at 10 lbs. to a gallon, 180 gallons ; instead of which, if we get 80 or 90 gallons, we are satisfied. It will thus be seen we have not approached more than half way to perfection.

I conceive there wonld be no saving in labour or fuel by converting cane-juice into rum. The value of the fuel and labour for boiling 400 gallons into sugar is just the labour and fuel necessary for our skip, (400 gallons usually making that quantity,) which takes about 1½ or two hours to boil, according to the working of the coppers. The labour, fermenting, and distilling would be at least half-a-day, and the fuel sufficient for three or four hour's fire, in which time as much would be consumed in the slow fire of the still as in the quick fire of the boiling house.

If it takes 3,000 instead of 2,000 gallons to make a hogshead of sugar, it is because the juice is not so sweet; it would therefore prove less by the saccharometer, and if converted into rum would not make more than the 2,000 gallons of sweeter liquor.

AGRICOLA.

NOTE.—Where rum-canes are ground for the purpose of accumulating trash, the still must be run with wood; but, if the process were carried on on a large scale, the trash would have to be used for fuel under the still.

COMPETITION

For the Prize offered by the St. George's Agricultural Society.

To the Overseer, or other person who shall introduce the best method of saving manual labour in the field cultivation by the introduction of agricultural implements, or any other method.

THE HOE PLOUGH.

This is in fact a diminutive plough, of the Wilkie construction, which I was the first to introduce, I believe, into the Island, certainly into this Parish, and for which I claim the above prize, on account of its saving manual labour in the field. It has a double claim, for, at the same time that it saves labour, it increases the produce.

The cost of the Plough is £4 10s. besides freight and charges out.

I have worked it with one horse, although that horse was not accustomed to draught, and was not corn-fed at the time, but I have usually worked it with two cattle. I had altogether four cattle for its use. I worked two every morning, and two every afternoon, turning them out at night in a good grass piece : they were worked with a common yoke and bows. I ploughed between the canes on about thirty acres; the usual depth of turning up the soil being about five inches. I had usually three people employed with it, as both they and the cattle were strange to the work; the man holding the plough at two shillings a-day, one stout lad, driving at one and three pence, and a little boy leading the cattle, at nine pence. When the cattle get accustomed to the work they will not require leading, and, if a horse be used, the ploughman alone ought to be sufficient, without assistance. When I first began to use the large plough I employed ten cattle and five or six people, but afterwards, when the cattle and people got accustomed to the work, reduced the number to six cattle and three people, so with this little plough I shall be able to reduce the number to the man holding the plough and the boy driving, and at the same time be able to increase the work, from the cattle drawing more steadily. The cattle when ploughing through growing canes were muzzled. When I first commenced using the hoe plough, I used to dig up the cane-holes that were in the way of it, but I afterwards found that the cattle and the instrument were both capable of cutting through them, so that the expense was unnecessary. In ploughing between the canes, I took as many turns up and down as completely fallowed the row in the manner of close ploughing : where I ploughed the land twice, the first time I ploughed quite close to the stoles, and threw the earth away from them ; the second time I reversed the operation, and threw the soil towards the cane ; always keeping the plough to the full depth. The advantage of ploughing the hard soil between the rows, occasionally, is so obvious that it is needless to enlarge upon it here. The width of the rows is immaterial, whether three feet wide or nine feet, the plough has only to go up and down till the surface is turned over, and the rotten trash ploughed in. When the grass grows, which it will do as luxuriantly as the cane, in consequence of the ploughing, the operation has only to be repeated once or twice according to the wish of the operator, or according as the plough can be spared for the purpose; or the piece may be cleaned by manual labour, as in the common process. Whichever process is adopted the return will be greatly increased. The hoe plough is equally well-adapted for moulding plants planted in ploughed land, but here it would be advisable to use a horse, as the horse would not tread on the young canes, like two cattle abreast must necessarily do. The trampling of a few young shoots in rattoons is not attended with the same bad results as in plants, where the trampling would probably displace the cane-top just as it commenced growing and injure it materially. Two of the cane pieces I ploughed were old rattoons, the other one was a peice of first rattoons which had been ploughed for plants, but, in consequence of heavy rain, so badly done as to be unworthy of being called ploughed. I therefore determined to give it a good ploughing as soon as cut, and accordingly burnt off the trash, and ploughed every row, throwing the mould on the top of the stool, so as to give it a heavy moulding. They ploughed four rows with each spell of cattle, and, as the wages were a dollar a-day, the cost was accordingly six pence a row, but I could not have got the piece moulded by task work for less than a shilling a row, and then by no means such a good moulding; and the middle of the rows would not have been pulverised ready for the young roots to strike into. The width of the rows in this piece, from the original bad ploughing, varied from less than four to upwards of six feet. The appearance of the canes is now very promising, much more so than when in plants. The cost of the weeding and moulding was thus only one half of the common process, and the work was twice as effectually done. The other canes were old rattoons; every second row of canes was destroyed, so as to make the rows eight feet wide: all the trash was then put on every alternate wide row, and the other one was ploughed. I mention the arrangement of the rows, because by the conditions of the prize all the particulars were to be mentioned, but, as I said before, the width of the row is immaterial, and is quite unconnected with the introduction of the hoe plough. The canes, on the part of the old rattoons that I ploughed twice, were, at the time that I left the estate, and when the effect of the ploughing was beginning to tell upon them, throwing up most luxuriant sprouts, far more so than on the previous year, and had every appearance, as far as I could judge, of producing a larger crop than on the previous year, although there were only half the number of rows of cane. I have tried several kinds of instruments for the purpose of cultivating between canes, and this is the only one that has given me any satisfaction; and, from my experience of it, I now feel convinced that it is as good and effectual an instrument as can be used.

W. F. WHITEHOUSE.

The prize offered for the above, was, when the competition was sent in, found to be withdrawn.

A similar competition was sent in to the St. Mary's Society, for a similar prize, but although no other party competed no prize was awarded, the members having come to the extraordinary decision that they did not see of what use the implement could be.

COMPETITION

For the Prize offered by the St. George's Agricultural Society.

To the Overseer, or other person, who shall introduce the best method of improving the quality of Sugar.

In competing for this prize, I will lay before the Society a valuable document I obtained from the worthy and respected member of Saint Thomas in the East, Alexander Barclay, Esq.. which he was kind enough to give me some time previous to my coming to this parish, and which was the foundation, to a considerable extent, of my improvement in making sugar. I will give the document entire, and then state in what respects I have followed it, and where I have deviated from it:—

"Saint Kitt's. Aug. 1831.

Dear Sir,—In compliance with your request, I have the pleasure to give the following sketch of the process of sugar-making, lately tried in this island.

'The principal points of attention in this process are, 1st, tempering the cane-juice with a saccharate of lime. 2d, low boiling.—3d, slow crystallization.

"The saccharate of lime carefully prepared is, I conceive, an active and valuable chemical agent, effecting the necessary decomposition of the juice very perfectly, without imparting to it anything like the same degree of colour, as lime in substance, or suspended in water, and the proportion can be easily and correctly regulated. The best mode of preparing the saccharate, is to add to every pound of temper lime, unslaked, and placed in any convenient cask, two or three gallons of hot clarified liquor from the third copper; when the consequent ebullition ceases, the lime should be well stirred up, the impurities then allowed to subside, and the clear saccharate may be drawn off for use by a cock inserted two or three inches above the bottom of the vessel. I have found it best to give the required portion of the solution to the cane juice in the clarifier, when it has acquired the temperature of 180 degrees. A short charge should first be given, and successive portions stirred into the juice, until the decomposition, (proved by a glass) be complete, subsidence rapid, and the liquor quite transparent- and of a light straw colour. When the proper quantity of temper for any given juice is ascertained, the full charge may at once be thrown in. The saccharate will keep a long time without undergoing any change.

"Low Boiling.—The object of this is not to drive off too much of the water; as too high a degree is injurious to crystallization. As good juices bear higher temperature than inferior, the proper point of skipping must depend on the quality, but the head boilerman will seldom err if instructed to strike somewhat lower than he has been accustomed to do. By the use of the thermometer, however, my own experience points out 230 degrees, as about the average heat for ordinary juices in this island.

"Slow Crystallization.—Slow undisturbed granulation is essential to the strength, size, and regularity of the crystals; additional coolers are therefore necessary in this process, the more the better; each cooler is filled in succession, and the granulating process allowed to proceed slowly, and without agitation. It is advisable, however, as soon as each skip is ladled into the cooler, to skim off lightly any crust that may have formed on the surface of the preceding strike, so as to prevent the formation of a thick dun crust, the weight of which would eventually cause it to sink through the uncrystallized syrup, and thus frustrate the object of the process, namely large grain. If colour be a more important object than grain, moderate stirring every second skip is found useful. The sugar is allowed to remain in the coolers until crystals cease to be formed, which is easily ascertained, and the syrup collected on the surface being removed, the operation of potting is then slowly carried on. The syrup removed from the coolers is put aside until there be a sufficient quantity to undergo a reboiling in the teache, and when judiciously treated, the produce is little inferior to the original sugar.

"A saccharate of potash was also tried, but though the sugar looked beautiful for a time, it was apt to deliquate in a week or two; this effect may, however, be prevented by also using a full charge of lime or its saccharate, prior to the application of the potash."

In preparing the saccharate of lime, I usually put a gallon of liquor from the third copper to each pound of lime. I had a puncheon sawed in two, so that one part would contain about 60 gallons, and set up on end, in which I mixed as much lime every morning as would serve for the day. The saccharate was drawn out, of a brandy colour, through a cock placed a few inches from the bottom to allow room for the sediment. In tempering the liquor in the pans, I used only to give about half the full charge of the saccharate of lime, and gave the remainder always in the second teache. Every time the teache boiled down, the head boiler tried if the liquor would cut, and added the saccharate to the second teache, until the liquor, after being filled up and further evaporated, cut freely. The saccharate was put into the second teache, instead of into the teache, because there was usually a small quantity of scum thrown up, which had to be brushed away before the teache was filled up. I consider it a great improvement the giving only half the temper in the clarifier, as the dirt is allowed to separate more freely from the liquor, whereas, where much temper is used in the pan, the liquor is invariably of a bad colour, from the dirt being chemically combined with the liquor by the lime; the adding the saccharate in the second teache seemed to have very little effect in darkening the colour, although added in sufficient quantities to make the liquor granulate.

In Boiling, I invariably do so in the way that boilermen usually call *boiling low*, and as recommended above.

TREATMENT IN THE COOLERS.—In this part my practice varies from that recommended above. The number of coolers employed, varies according to the quality of the sugar: my plan is always to throw a skip upon previous ones before they become hard; sometimes the second skip is thrown on the first, sometimes the third skip is thrown on the first, according to the saccharine quality of the liquor, and according to the quickness with which it cools. I then mix the two skips intimately together, which operation takes some minutes, and not simply stir the skip on the surface of the hard one, as is commonly done; my object is to make them mix intimately together, as the small chrystals, formed by cooling the previous skip, now become the nuclei for the hot syrup to granulate upon, and therefore the size of the grain must be increased: the sugar by this method retains its heat longer, and the chrystals have more time to form, than in the common process. I usually found that all the syrup had granulated by the next morning, so that there was none to be boiled over again. My usual plan is to pot the sugar the first thing each morning, or every second morning, before any hot skip is thrown upon it.

I have never tried the effect of the potash recommended.

That the Gibraltar Sugar was much improved under my management, I believe, will be generally admitted, from the fact of its taking a prize at the exhibition, and the above was the system adopted in such respects as differed from the usual process, and for the introduction of which into the parish I claim the prize.

W. F. WHITEHOUSE

N.B.—The Prize offered was, in this case, also withdrawn.

PLOUGH vs. HOE.

Sept. —, 1842.

TO THE EDITOR OF THE JAMAICA STANDARD.

> "A bright Ploughshare is the cheapest commodity ever used by a Farmer."—COBBETT.

Labour becoming scarcer day by day, it behoves us without delay, to improve our system of agriculture, so that an equal amount of work may be done by a smaller number of people : our success depends upon it; and the sooner our endeavours commence the better for ourselves. It would be folly to shut our eyes to the broad hints thrown out by all parties, even by ministers themselves, as to the reduction of duties; it is plain that such a measure is contemplated, and that before long; we are only sure of the present year for "putting our houses in order;" let us, therefore, make preparation for our coming fate. An improved system of agriculture is our best hope. It is necessity alone in all countries that has forced Farmers to adopt new systems, and to adapt themselves to the alteration of the times ; but the process has usually been slow ; our's, unfortunately, has been rapid in the extreme, and we are shortly about to be subjected to a still greater trial. How are we to meet the crisis? Immigrants we are likely to obtain, but not more than sufficient to compensate for the withdrawal of labourers retiring on their fortunes; wages are therefore not likely to be reduced. When the duty is lowered, however, how are we to continue to pay the present rate of wages, without we adopt methods of reducing the quantity of labor requisite for the cultivation of a sugar estate? A great improvement may be adopted in field cultivation by the introduction of the Tullian system of agriculture.—It is now the almost universal system adopted in Great Britain, and the products of the farms have been increased enormously in consequence.

I may, on some future occasion, bring forward Tull himself in confirmation of the excellence of his system; on the present occasion, I mean to bring Cobbett as my authority. The Tullian system has now stood the best of experience. Cobbett states that all the knowledge he has obtained worth knowing on agriculture, he has learned from the works of Tull. Although in matters of politics most will oppose Cobbett, yet in his agricultnral works, he stands pre-eminent, and none will be bold enough to gainsay them. The work best adapted to illustrate Tull's system, and to be an useful lesson to us in agriculture, is his work on the cultivation of Indian Corn, or "Cobbett's Corn."

Before proceeding to apply his instructions to the cultivation of the cane instead of corn, I may remark that corn appears to be an advantageous crop for resident proprietors to cultivate—it would be ruinous for agents to be allowed to cultivate it, but it appears to be well worth the attention of resident proprietors, and to them I recommend the attentive perusal of the volume.

In illustration of the Tullian system, I will give such extracts as will elucidate the subject—almost the only alteration necessary in applying it to the cane, is to substitute the word cane instead of corn.

Speaking of the preparation of the soil he says, it is of little consequence compared with the proper cultivation of the corn, while growing. "It is true that (in the United States) very great crops do not arise from soil and preparation like this; but crops do arise from it, if there be due and true *after cultivation*, upon which the Farmer in America principally relies nine times out of ten. It is the *after cultivation* upon which the corn planter may on the Tullian principle, place his chief reliance.

Now, we give the cane nothing that he would call after cultivation.

PLANTING.—"If you determine on hills, you ought to place them four feet apart, and then, if you mark the ground *truly*, you may plough long ways the field at one time, and cross ways at another time, as Mr. Tull saw them do in the vineyards of France, whice gave rise to his famous book on the horse-hoeing husbandry, and which book was the foundation of all the improvements in agriculture in this country. This cross-ploughing, or horse-hoeing, is very good ; it hills up the plants pretty completely, without any hand work, or with very little, and it leaves scarcely anything to be done with the hoe.

"But in the case of the dwarf corn, or Cobbett's-corn, I prefer rows. My distances this year have been, plants eight inches a-part in the row, and the rows *three feet* a-part. But I am convinced that these are not the proper distances. Three feet do not give room for good, true, and tolerably deep *ploughing* ; and that is the main thing in the cultivation of corn, which, indeed, will not thrive, if the ground be not deeply moved, and very near to the plants too, *while they are growing*. The *reasons* for this are given by Mr. Tull; but, I have seen enough of the experience.

"Now, you cannot plough deep and clean, and indeed you cannot perform any thing worthy of the name of *ploughing*, in so narrow a space as that of three feet ; you require four feet at the least ; and, for the reasons I shall presently give, I prefer *five feet*. This year I was compelled to content myself with hand-work, that is to say, with two miserable flat hoeings, which is tillage quite insufficient for corn ; it merely keeps down the weeds, and it hardly does that."

Now, with these miserable flat hoeings do we treat that noble plant the cane, and then, in our wisdom, we say we have cultivated it. What he calls cultivation, we shall see in the sequel.

Again, he says, "You may, with great care, plough cleanly and deeply in the space of four feet ; but you can do it a great deal better, and with more facility in a space of five."

If a space of five feet be requisite for the cultivation of dwarf corn, what should be the distance allowed for the cultivation of such a luxuriant plant as the cane ?

TRANSPLANTING.—"This work should be done in *dry* weather if possible, and should *follow closely upon the heels of the plough*. This is a thing prodigiously advantageous to the plants ; for, a fermentation takes place in the earth at every moving, and here this fermentation comes to the aid of the plant, which has a root ready formed to be operated upon, and which strikes off immediately.

This advice is equally applicable in regard to planting canes; it should be done immediately the hole is opened with the plough, and in dry weather, if possible—not one top will fail to grow.

SUMMER CULTIVATION.—"As soon as the plants are of the height just mentioned (three inches) you take a small hoe, with *sharp corners,* and hoe all the ground on both sides of the row of plants, to the distance of six or eight inches, and at a time when the ground is *not wet.* Take care to *move all the ground* between the plants *and close up to their stems.* After this hoeing the plants will soon be from six to eight inches high, and the weeds will push on, in crowds innumerable, over all the rest of the ground. Now, therefore, the *plough* must begin to move; not only for the destruction of the weeds, but for the furnishing of *fresh food for the plants.* The interval is five feet wide; the plough begins in the middle of it, and turns three furrows on each side towards the middle of the interval, and going, when ploughing the two last furrows, within *two or three inches of the stems of the plants, and going a good depth,* throughout the whole of the work; not, at any rate, less than six or seven inches. When you have ploughed one interval, go, *not to the next,* but to the *next but one;* and thus go on over the field, leaving every second interval *unploughed.* All these ploughings of the intervals ought to be performed when the ground is *dry* on the top.

"At the end of four days plough these same intervals *back towards the plant;* and, at the end of another four days, plough *from the rows.* the intervals that were left unploughed before. The reason for this is, that, in the ploughing, some of the roots of the plants will be, and *ought* to be, broken or cut off; and, it is not right to do this on *both sides of the plant at the same time.* Four days are enough to allow for the killing of the weeds in the first instance; and, in the second instance, four days are enough to allow for the plants making new roots in the newly ploughed ground. At the end of another four days, plough back the second set of intervals; and thus all the ground has been completely ploughed twice, and the weeds all destroyed."

Our planters, I am afraid, will say, this is all very good in theory, but how are we to put it in practice?" Immediately a plough is mentioned, a vision arises before their eyes of a large heavy plough drawn by at least eight or ten cattle, and with half a dozen drivers: such, certainly, would be a formidable machine to put into a piece of young plants; but is such a machine necessary? By no means; a small light plough, drawn by two cattle, is the proper instrument. Such an one I exhibited at one of the Saint Mary's ploughing matches a few months ago, when the two cattle fallowed as much land as the large ploughs with ten cattle, cutting through the cane stoles, and competing in every way, except in not going quite as deep: and with this plough, never worked by more than two cattle, I have ploughed a considerable quantity of land.

" In this ploughing back, care ought to be taken to lay the earth as close up to the plants as possible. It ought to be a *swing* plough for this purpose, or, at least, a single-wheeled plough; for you could not go close enough with a double-wheeled plough, without crushing the plants. The horses, or, which is better, the oxen, should move slowly and steadily; not be whipped, so as to make them hurry and strain themselves, and be thereby induced to spread their feet widely in their march near the corn. In all the beautiful scenes of agriculture nothing is so beautiful as this operation, if it be performed with proper implements, a proper degree of strength, and with due care.

" Thus ends the first ploughing, after which you will see the plants push away at a prodigious rate. These repeated ploughings (for I have more to speak of) require labour and expense; but put these against the *dung-cart*, with all its previous and subsequent consequences, and you will soon find that a bright plough share is the cheapest commodity ever used by a farmer. Until the time of Mr. Tull, the drill husbandry was totally unknown, until within comparatively a very few years, putting turnips in rows, and ploughing or horse-hoeing between them, was never so much as heard of. A gentleman told me, the other day, that Lord King grows *fifty tons* of mangle-wurzle upon an acre, *with rows at four feet apart.* Another may grow as great a crop with rows closer together; but that other will have his land exhausted by the crop, whilst the ploughings of Lord King will give him his great crop, leaving his land in as good heart as it was before. If, therefore, this wide tillage be practicable and beneficial in the cases here mentioned, what must it be, how obviously must it be, the proper tillage in the case of a tall and bold plant like the corn?

What stronger remark could he have made if he had been asked his opinion on the cultivation of the cane.

" Tull was taught the benefits of inter-tillage by seeing the plough go between the vine-sets in the vineyards of France; he saw the beneficial effect which that had upon the plant itself, upon the size of the grapes, upon the quantity of juice, and upon the quality of the wine. This fixed the principle in his mind, and he successfully applied it to wheat-fields, those of sainfoin, those of lucern and of turnips.

" We have now seen the first ploughing of the land completed. If the ground be not very foul, one more ploughing is sufficient; that is to say, one more *double* ploughing—a ploughing from the plants, and another to turn the earth back. At this ploughing you must not go *quite so close* to the plants as you did before; but if you now leave six inches between the plants and the plough, it will be quite enough, taking care to plough by alternate intervals.

" Let no one be afraid of the consequences of thus tearing about the roots of the plants when they are at this advanced age and height. Ninety-nine of my readers out of a hundred, and I dare say nine hundred and ninety-nine out of a thousand, will shudder, at the thought of tearing about in this manner; thinking that breaking off, tearing off, cutting off, the roots of such large plants, just as they are coming into bloom, must be a sort of work of destruction. Let them read the book of Mr. Tull; or let them go and see my friends the Yankees, who generally drive the thing off to the last moment. By-and-bye, however, the Yankee comes with his plough; and it would frighten an English farmer out of his senses to see how he goes on, swearing at the horses and tearing about the ground, and tumbling up against the plants; but at any rate, moving it all pretty deeply, somehow or other. I have seen them do this when the tassel was nearly at its full height, and when the silk was appearing from the ears. One rule is invariable; that is, that if the corn be not ploughed at all there will be no crop; there will be tassel, and the semblance of ears; but (upon ordinary land, at least) there will be no crop at all.

"If the reader will neither go to America nor read the book of Mr. Tull, which latter is quite sufficient for any rational person, he may take a spade, and go to two rows of cabbages forming part of a plat of that vegetable, and dig between these two rows, putting the top of the earth where the bottom was before. Let him (though this is a fine recipe for the gout) now lay by the spade, and take another instrument, called a *hoe*, which he may use without inconvenience to his back, and just scrape over the ground, and kill the aspiring weeds over the rest of the plat. Let him look at the whole plat in a week from that time; and, though these two rows have had but half tillage, the greatness of their progress, compared with that of the rest, he will find to be surprising. If you cut off the root of any herbacious plant in the summer time, it is like cutting off the shoot of a tree; several roots come out immediately, instead of the one there was before: these bring fresh supplies of food, and the plant flourishes and produces accordingly.

" I have spoken of the ploughings between the corn as being to be performed by two oxen or horses. In very light ground it may be done with one, with a pair of reins, with a swing plough well made and light; but generally it will be done by two, for, the deeper the ploughing is the better."

That two cattle can do the work I know from my own experience as I stated before.

When such a system becomes general, Jamaica may hope to see better days; and every effort should be made to adopt it before our difficulties increase upon us.

AGRICOLA.

PART 3rd.

JAMAICA AGRICULTURE.

TO THE EDITOR OF THE JAMAICA STANDARD.

Sept. 19, 1842.

SIR,—I was much amused by the perusal of a letter in your columns, from A Veteran Planter, requesting you, with modest assurance, to discountenance all attempts at improvement in agriculture, as innovations bringing destruction upon the planting interest. The old gentleman only denounces what he disapproves, but brings no arguments forward to show the danger of the proposed improvements, and expects you, like a dutiful child, to take his word for it, and ask no reasons why. The letter is a genuine specimen of the old school; I can almost fancy that my veteran antagonist belongs to the good old times, when men wore powder and pigtails. I should have been afraid to encounter such a formidable adversary, only that he comes to the contest unarmed with arguments, and unprotected by facts. I must apologise for not having sooner entered the lists with him, but presume it is better late than never. I also beg leave to hope that we may have a few more friendly encounters together, as there is nothing more likely to elicit truth, than the having both sides of the question fairly discussed.

But now to the points brought forward in the letter. Leaving the Civil Engineer to fight his own battle, I being one of the "dangerous enemies" denounced, shall undertake the defence of the Agricultural department.

The Veteran Planter is truly unfortunate in the specimens he has brought forward of the innovations upon the "good old system," which he says are to be the ruin of the country. Taking all his specimens seriatim, the first is the impropriety of making gentlemen from the Army and Navy, Law and Physic, Attornies. Nothing either he or I can say to the contary will have the effect of deterring proprietors from appointing such gentlemen, if they consider it their interest to do so. There is nothing, however, to prevent such gentlemen from managing estates equally well with those regularly brought up to the business, if they have sense enough to make good appointments in the subordinate situations, and do not turn Overseers themselves. But the Veteran Planter seems to think that such people will, as a matter of course, immediately set to work to change the whole routine of management: nothing is more unlikely, for changes are only effected, in this country, by the greatest perseverance and determination, attended with much trouble to the party introducing them, and who, as Attorney, can have no interest in so doing.

I was not aware that such an intelligent man as *Nauticus* had resided in this country, and had endeavoured to introduce so many excellent improvements; if we had been fortunate enough to have had many like him, things would now have been in a better state, and the management of estates better understood. He was quite right in his opinion "that the shore was analagous to the sea, and that the plough should stir up the earth, as a ship stirs up the water." That such an opinion is borne out by the general consent of the Planters now, witness the number of Agricultural Societies and Ploughing Matches established.

Why laugh at Nauticus for wishing to carry on the work of an estate "Man of War fashion;" could he have picked out a more perfect specimen of discipline and good management than what is afforded in that service, and more worthy of imitation, barring the cat-o'-nine tails? If such a system could be accomplished now, we Overseers would have an easy berth of it, and the Proprietors would reap a profitable harvest, instead of being on the brink of ruin.

Nauticus' next proposal was to use only the land near the works, enclose it with stone walls, and cultivate it highly; he could not have proposed a more rational plan: the "good old plan of working different parts of the estate by turns," is a very bad plan, if it can be avoided; which it may on all land where the plough can be used. How few tales of the destruction of canes by the trespass of stock would have been told at the first of August, if Nauticus' suggestion had been carried into effect. Besides, even now, it is the best plan that can be adopted, for these reasons: the trespass of stock would be avoided; the expense of watching would be reduced; the length of cartage would be lessened; and the land being constantly cultivated, would be less subject to weeds.

Nauticus was warned, "that the soil was too poor for the canes to rattoon, he would nevertheless have the same land always continued in cultivation. Such was the practice in England for cabbages and potatoes, and such of course should be the practice in Jamaica for sugar-canes. The land was to be penned (how, is not very clearly expressed)—the product of these pens well ploughed in was to compensate for those long years of rest, to which every judicious planter consigned his exhausted cane fields for spontaneous renovation." Excellent—all excellent. The science of agriculture is the same all the world ever; and the system that makes cabbages and potatoes grow in England, will make any plant grow in any part of the world of which it is a native. Nauticus was bold enough to entertain the opinion that the cane would rattoon, if well cultivated and ploughed, and would no doubt have proved it if he had had the management of the estate long enough,.

As to irrigating canes in dry weather, what could be a better proposal—almost all tropical countries use irrigation—the only question is, as to the expense at which Nauticus proposed to do it, on which point the Veteran is silent.

Next, his ideas of working cattle; he condemned the working of cattle that had been starved in the pen all night; and recommended the use of the collar instead of the yoke, or the yoking them by the horns, which is in common practice in the Peninsula, where he had probably seen it, and where the cattle are said to do one-third more work in consequence. I think nobody but the Veteran Planter will see anything ridiculous in his endeavouring to feed cattle better, and to make the work more easy for them—the *topping lift* I don't understand.

The next imperfection that attracted his attention, was the too close planting of the cane. "To the want of room to breathe, and to feed, was ascribed every disease and disaster to which the cane is liable. If burnt up, they were *starved. smothered, suffocated!* If the poverty of the land prevented their rattooning, the cause was still the same, the remedy in all cases, the cure for all evils, more space—more manure—more ploughings!" If Nauticus happens to be dead, I propose the following epitaph for him:

HERE LIE THE REMAINS OF NAUTICUS,

Who, anxious for the prosperity of his country, endevoured to introduce many rational improvements in the management of estates, and who summed up the requisites for the successful cultivation of the Sugar Cane in the following

PROFOUND MAXIMS

MORE SPACE—MORE MANURE—MORE PLOUGHINGS.

If Nauticus be still alive, I should willingly travel fifty miles to pay him the tribute of respect due to his intelligence and foresight; he has completely forestalled all my proposals; these are the very conclusions that I have arrived at from my own experience, and with the help of all the agricultural works I could procure; and which in my sundry letters I have endeavoured to prove by force of argument; I trust not without success. Henceforth I shall adopt the motto of Nauticus, "More space—more manure—more ploughings," and all who follow it will be sure of success. Unfortunately for Nauticus, as the Veteran informs us, the old attorney just returned when he was on the point of success, and deprived him of the laurels he would undoubtedly have obtained, by carrying his plans fully into execution.

The Veteran Planter, only denounces the system of wide planting as ruinous, without any arguments in support; I have proposed the wide distances, and backed the proposal by sound reasoning, which, as it has only lately appeared before the public, it is unnecessary to repeat: I now challenge him to controvert one of the arguments I brought forward in support of the plan, and, until he does so, he has no right to ask the public to believe his statement.

I now come to the concluding portion of the letter, which, altho' he has not mentioned my name, is an attack on myself, for he quotes my writings; I mean the "Overseer's sheet anchor" business, the corn affair. In the first place, he speaks of the cultivation of corn between the canes, and then quotes my remark, in recommending the cultivation of corn, according to Cobbett's method, by itself, as a crop, in contradistinction to the cultivation of it in conjunction with the cane; the two methods are quite distinct; —although all corn crops are exhausting crops when cultivated in the common way, it is only by repeating them year after year, that they can ruin the land. In cultivating corn with the cane, the crop can only be repeated once in five or six years, and therefore, although injurious, cannot be ruinous. Formerly, in England, farmers were in the habit when their leases were nearly up, of taking repeated corn crops off the land, or, as it was commonly and expressively called, *scourging* the land; in self defence the landlords now insert clauses in leases to prevent it. If corn were to be cultivated as a corn crop for profit by agents, such would probably be the case here, as it is the interest of an agent to make the profits as large as possible for the time being, without looking forward to the future; a resident proprietor would, on the contrary, naturally do so, and limit his present profits, and it was with this view that I said and now repeat, " that it would be ruinous for absent proprietors to permit their agents so cultivate corn upon their estates." It is a fortunate thing for them that the cane is a green crop and not an exhausting crop, else from the bad usage the land has received, it would have been perfectly barren years ago, and the Veteran and I might have met up in some far distant land.

Having now proved that my remark does not apply to the case in point, I come to the " sheet anchor" business. " The planting of corn to shield by its more rapid vegetation, the tender canes from the parching influence of a vertical sun, may well be termed the *Overseer's sheet anchor* ; deprive us of this resource, and we are inevitably lost. Jamaica may be for ever erased from the list of sugar colonies !" This is so very absurd that it scarcely deserves an argument—following his example I might simply deny the statement, and affirm that corn is injurious to the growth of the cane ; such, however, is not my habit. The food of plants is obtained from the atmosphere, from rain, and from the manure in the soil. Now, the cane and the corn, both consume the same food—how then can the one supply of food maintain the two crops as luxuriantly as if only one were there ? To make it more evident to the Veteran, let him turn two of his horses into a pasture only containing grass enough to maintain one, and then, at the expiration of two or three months, he proves that his two horses fatten where there is only food to maintain one in health, I will believe his proposition that two crops can thrive better on a certain portion of land than one, which is what he maintains. If the corn acted only the considerate part of an umbrella, and did not consume the food prepared for the nourishment of the cane, there might be some truth in the statement ; but even then I should dispute the point, for the cane is a tropical plant, and does not require shade. Now, Mr. Veteran, has it ever occurred to you, in your wisdom, before making such a sweeping assertion, as that Jamaica will be totally ruined if the cultivation of corn between the canes be given up—has it ever occured to you, I say, just to try the question, by planting half a cane-piece with, and half without a corn crop ?—If such has been the case, you might have given us the benefit of your experience. Waiting the result of your experience, however, I will give the result of mine. A resident proprietor, now in the country, who came out to manage his estate, on account of the hardness of the times, and who is now doing uncommonly well, took it into his head, being a shrewd and intelligent man, and having had some experience in the cultivation of cabbages and potatoes, to try the point in dispute; he planted a cane-piece, and in one half he planted corn, and in the other none! and what was the result? Why, undoubtedly, the Veteran will say, the part that had the genial protection of the corn to shield it whilst young from the vertical influence of a tropical sun, gave a much larger return. Quite the reverse, the part without corn produced nearly half a hogshead an acr', more than the other! I will not say that such is the result in every case; because some land may be so very rich, or so well manured, as to allow a moderate crop of corn to be taken off without perceptible injury; but I will maintain that in all land of moderate richness, the cane will be better without the corn. Since I was informed of the above fact, and as it is quite agreed with my own opinions, I have put in about fifty acres of canes without any corn, and really have seen as yet, no result to make me believe that I have been hastening the ruin of Jamaica by so doing. I shall therefore beg leave to christen the Overseer's sheet anchor by the more appropriate title of the Forlorn Hope, until the Veteran can establish the title on better grounds than he has already done.

AGRICOLA.

TO THE EDITOR OF THE JAMAICA STANDARD.

October 5, 1842.

SIR,—I was much pleased with your article on Agricultural Chemistry; it is, to most parties, a very dry subject, but it is necessary for an agricultural community to study it, if they hope to have a thorough knowledge of their business, or to be able to introduce improved systems on a secure basis. Sir Humphry Davy may be said to have laid the foundations of the science, and Liebig to have raised the superstructure, and completed the edifice: it now only remains to be ornamented and beautified by future writers.

Agricultural Chemistry explains to us many particulars in our practice, which were before hidden from us, and assigns satisfactory reasons for them, thus giving us confidence in the result.—"Knowledge is power;" and whilst the man ignorant of the science, when placed under different circumstances, wanders in uncertainty, and probably adopts an improper system; the man versed in the science at once adapts himself to the change, and looks forward to success with confidence. What can be a greater change for an Overseer, than to be moved from a wet to a dry district—from a gravelly to a stiff cold clay soil—from a level to a hilly estate, and yet we must all be prepared for such changes, and in every change there must be many different alterations in the practice of agriculture. An Overseer ought therefore to prepare himself for such, by a study of the science. To instance one case in particular. How many farms have been almost ruined by the application of lime, although, when properly applied, it has more than doubled the value of other farms; and what was the difference —ignorance on the part of the party applying it, of the different circumstances of the two cases, and which he was unable to discover from the want of the requisite knowledge

The cause of the fertility of our soil having remained as good as it is, is now explained to us from the fact which you state, and which Liebeg fully demonstrates, that the very best manure for a plant is the plant itself. This to a considerable extent, is the system we have hitherto adopted, without knowing the cause why it was successful. We have never carried away more than half the cane from our lands, thus leaving the other half in the shape of trash and longtops to rot, and form manure for the succeeding crops. This, although it made the land rattoon for some years longer than it would have done, if all the cane had been carried away, was not sufficient to keep it in heart, and it accordingly got worse and worse each year, till the piece was neglected, as too poor. In rotting all the most enriching parts of the dung escaped into the atmosphere, unknown to us; whereas science teaches us, the trash should have been buried in the soil, and then all would have been consumed by the plants. The practice was right, so far as returning the same plant back to manure the land from which it came; but it was not applied in as favourable circumstances as it might have been. If the residue of the cane had been applied under, instead of on the surface of the soil, the land, instead of becoming poorer, would have become richer year by year. This I proposed some time ago to do, both on the authority of Sir H. Davy and Liebig, by chopping it up small, and ploughing it in; by which means we could make the land inexhaustibly rich. We have only as yet carried the system half way, and are much in the same situation as farmers at home who allow the best part of their manure, the liquid from the dung heap, to drain away and run to waste.

The more a correct knowledge of agricultural chemistry spreads, the more attention will be paid to such points of management in farming; and the time will come, and that before long, I hope, when such bad management will be only matter of history. One of the best features of our Agricultural Societies is the establishment of libraries of agricultural works for the use of the members. The whole of my knowledge of agriculture, I have gained from works I have read since I came to this country, and from my comparing the old system here with what I considered from them ought to be correct; urged on also, since the feedom, by the actual necessity of finding substitutes for manual labour. Brought up in a town, I scarcely knew what a plough was. When I came to teach others the use of it, I found it necessary, first of all, to instruct myself, which I did by reading and daily practice, till perfect. Every instrument I have since adopted was in consequence of the recommendations of these works, and I may safely say, that all have perfectly succeeded, so that some good has been obtained from reading.

I see you state, in another part of your paper, that the Governor has offered the munificient sum of £100 to be awarded to the writer of the best essay on cane cultivation. It is a very handsome act on his part, and shews the interest he takes in our welfare: you do not, however, state the conditions which I shall be glad to learn, and which you should give for the benefit of the " Veteran Planter" and me, that we may both have a try for it.

AGRICULTURAL CHEMISTRY

TO THE EDITOR OF THE JAMAICA STANDARD.

October 25, 1842.

The Veteran Planter having summoned his Battalions to his assistance, I have waited a week for their broadsides, expecting of course some thundering vollies, if harmless for want of shot, yet making a noise and showing fight. Whenever they feel inclined, I am ready to meet them on the battle-field, armed with the study of Organic Chemistry, backed by my own observation and experience as a planter.

I must inform the Veteran that I am a genuine planter and nothing else; I must confess, however, that, when a youth, I did not come under the description of the dutiful children and apprentices, so ably described by him, but was classed amongst the naughty children who, not satisfied with doing as they were ordered by their instructors, and following the example of their fathers and grand-fathers, had the temerity, folly, or impertinence, whichever he likes to call it, to seek for the reasons for all the practices they saw adopted, and who, thinking that from the march of intellect, the present generation were wiser than their predecessors, hoped that there was a possibility of improving their own particular department of the arts and sciences.

As to my opinion of Nauticus, I had never heard of him or his system, until mentioned by the Veteran—if I had supposed he had been still in the country I should probably not have spoken of him in such flattering terms, for fear of being accused of adulation.

I hope the alterations I may propose, will not be considered by the Veteran, or any other Planter, as improvements, until they are convinced of the correctness of the principles on which they are founded; every alteration does not turn out an improvement, as has been often already proved. I never change my opinions, until convinced by sound arguments, and I hope other people have the same firmness; I hope also that I may never propose any change without supporting it by convincing arguments. On the other hand, I trust that firmness will not degenerate into obstinacy, or wilful blindness; but that they may meet with the interest and attention that all projects deserve that are for our common benefit.

The study of Organic Chemistry, unfolds to our view the causes for all the effects we at present are in the habits of accomplishing, without our knowing the why or the wherefore. It must infallibly cause the overthrow of all systems founded on wrong principles, and place on a firm basis those practices which are advantageous. The study of it has already exhibited to me with overpowering conviction, that many of our practices are totally wrong; when I find these errors confirmed by my own experience, and the experience of intelligent planters amongst my friends, I shall expose them fearlessly; when I find our practices backed by the sound principles of science, I shall state the reason, and endeavour to confirm all part es in their use; but I ask nobody to practice what I propose, without being first convinced of the soundness of the principles laid down.

Now for the Corn question. The Veteran first challenges me, then asks for a drawn battle, and finally calls forth his battalions to annihilate me; curious tactics these.

The challenge I pass over, not because I am unable to accept it, but because it was indiscreetly put on his part.

When I brought forward the fact of a corn crop having made a difference of half a hogshead an acre, or thereabouts, I expressly denied that such an inference was tobe drawn in every acre; but I maintained that the corn was of no use in shading the cane, and that, in every case, the cane would be better without it; since then a further study of the vegetable economy of the cane and corn has induced me to change my opinion in one case. Where land has been manured with flying pens, the quality of the sugar will be much improved, and the quantity not perceptibly diminished, by taking off a corn crop,

The following are the results at which, from a study of the subject, I have arrived. Will the Veteran say, after mature deliberation, whether they do not coincide with his experience ?— If such prove to be the case, and I am supported in the opinion by some excellent planters, a most unlooked-for result arises. The subject will be new to him, as it has proved to my friends and to myself, for we have never had our attention drawn to the point, but, I dare say, many cases of failure will now recur to his memory. It is constantly the case that planters are entirely deceived in their expectations of a corn crop, much to their surprise, where they pay every attention to it. When the cause of a good corn crop comes to be known, they will plant only when there is a certainty of a return.

In every case it is supposed that the canes and corn are carefully cultivated.

1st,—That land manured with flying pens, invariably gives good returns.

2nd.—That land manured with rotten dung carted to it, gives only a middling crop.

3rd—That land lying fallow for some years, gives a middling crop.

4th—That new land gives a middling crop, generally in some cases a large one.

5th—That land constantly kept in canes, and without manure gives none.

6th—That cane pieces burnt off and planted amongst the rattoons, gives none.

7th—That ploughed land, in each case, does better than land dug with the hoe, if the corn be planted sufficiently early—otherwise the rapid growth of the cane prevents the corn from coming to maturity.

The favor of an answer will particularly oblige

AGRICOLA.

PART 4th.

JAMAICA AGRICULTURE.

TO THE EDITOR OF THE JAMAICA STANDARD.

Nov. 15th, 1842.

I was much pleased, on the perusal of the proceedings of the St. Andrew's Agricultural Society, at the project of forming a Central Board of Agriculture. A similar idea had occurred to myself, that we should have a Central Agricultural and Scientific Society at Kingston, which should be in communication with all the branch societies, and which should publish annually a volume of transactions of every matter connected with and inducing to the improvement of agriculture, mechanics, &c.; also statistical accounts of the agriculture and geology of the island: in fact everything that can conduce to the welfare and prosperity of the Island.

The Highland Society, and the Royal Agricultural Society of Great Britain, are conducted on some such plan; the branch societies all communicating matters of interest to the parent society to be published annually. The being elected a member, should be an honorary distinction, the same as members of the Royal Society. I do not know the constitution or objects of the present Jamaica Society, but as I believe that most of the leading people in Kingston are members of it, it might at once be converted into such an institution with great advantage to the country. The transactions would become a volume of great interest to the community. A model farm at the expense of the country, where the nature of manures, systems of cultivation—implements of husbandry, and improved methods of manufacture might be tried, would be very advantageous, if conducted under the auspices of the Society, but I fear the state of the finances will not allow it; much good may however be effected without it. The Society might recommend those deserving of remuneration to the attention of the Legislature, and bestow honorary medals and distinctions.

I have also viewed with much satisfaction, the attempts in various parishes made by the overseers for the benefit of absent proprietors, and for their own honor, by proposing handsome prizes for increasing the crops, etc, Absent proprietors, if they know their own interests, will support them cheerfully in such endeavors, the welfare of their properties depending much more upon the exertions of the overseers, than of the attorneys ; for, however good the arrangements of the attorney may be, unless the overseer back his efforts with hearty good will, those efforts will not be crowned with success. Overseers are the mainstay of the island, and let them thus refute by their acts the calumnies that have been heaped upon them. They are the majority in all the societies, let them support their own interests, which they cannot do more effectually than by supporting the interest of the proprietors.

I see many prizes proposed for the benefit of the proprietor, but from the thing being quite new to us all, many of these proposals will not effect the object aimed at as well as could be wished. Let me suggest the following prizes, which I think will meet their views.

To the Overseer of the Best Managed Estate, a gold medal, or a silver cup, with a suitable inscription. To the second competitor, a silver medal, suitably inscribed.

That every estate, whether level or hilly, rich or poor, large or small, may be able to compete for it on equal terms, it is necessary to draw up rules that will suit all.

These are what I propose—

The criterion in awarding the prize to be the combination of excellence in the greatest number of the following points of good management.

1. Large amount of Sugar made in proportion to the extent of the cane-field, and the usual yielding of the estate.

2. Large amount of Rum made in proportion to the quantity of sweets employed and the strength of the spirit.

3. Small amount of Wages expended for carrying on all the work of the estate, in proportion to the extent of the crop of sugar and rum.

4. General good management of the cane-field ; a simple and easy method of manuring a small extent of plants in proportion to rattoons, and the least expensive system of cleaning the canes.

5. Requisite extent and clean condition of the open and enclosed pastures, according to the number of the stock.

6. Good condition of the Roads and Fences, for facilitating the carriage of the canes to the mill, and the prevention of trespass.

7. Best condition of the Stock, their greatest increase, and smallest decrease; the requisite number purchased and sold off.

8. Good condition of the Machinery, Coppers, &c. at the Works, so as to facilitate and insure the taking off the crop with certainty and speed.

It will be seen by the above, that all estates will have the same chance of success.

The Judges in considering each point of good management might keep an account thus; if the competitor did not excel, reckon 0, if he was successful, reckon 1, if very successful 2; thus the competitor who was most successful in the greatest number of points would reckon the highest and be the winner.

This should be the grand prize for each Society, and should be decided, as well as all the rest, in the August holidays.

The other prizes I should propose, are

To the Overseer who made the largest sugar crop from the smallest cane-field.

To the Overseer who made the cheapest sugar crop.

To the Bookkeeper who made the largest rum crop, in proportion to the sweets used and the strength of the spirit.

To the Overseer who introduced the best method of cultivating canes by agricultural implements, or who introduced new implements saving the greatest amount of manual labour in the field.

To the Overseer who introduced machinery at the mill or manufactory, saving the greatest amount of manual labour.

For improving the quality of sugar.

For improving the quality of rum.

In each of the above cases, a silver medal with a suitable inscription. Regulations must be formed for the judges to decide by.

Let Overseers propose such prizes, and though some attorneys may throw cold water upon their undertaking, let them carry them into effect, and they will meet with the ready support of the proprietors and of those attorneys who have the real interests of the estates at heart.

Before closing, I wish to ask Mr. Whitty when we are to have his proposals for the steam plough laid before us. We planters are anxiously waiting for the information. My own opinion is that the proposal will never be brought to a successful termination in this country. I do not at all doubt the possibility of the thing, but I dispute the probability of doing it with profit. The country is not at all suited to it: it will answer in Demerara, but not here: I believe it is now at work in that country. There the estates are three, four, or five miles long, in a perfectly straight line running back from the sea, and only 3 or 400 yards wide; up the centre runs a canal, and up each side a ditch, and all the canepieces are perfectly level, and of one diameter: the engine is in a boat in the centre canal, and the boat to which the endless chain is attached, goes up the side trench, and the plough works backwards and forwards between them. But here, how different is our situation: putting hilly estates altogether out of the question, how many level estates are there which would answer for the steam plough? None, that according to my idea of the thing, would do so to advantge. The Works are generally situated in the centre of the canefield. If the engine is made to go on a railroad, the railroads must diverge in all directions from the Works, as a centre; if made to work on common roads, those roads must all be macadamised. Then, again, how many rivers and gullies would the engine have to cross? And, supposing the cane-pieces are not parallel, must not the endless chain be shortened every turn of the plough?

Again, Mr. Whitty proposes to make the engine bring home the canes in waggons to the mill, but how are the canes to be got from the cane-pieces to the waggons?—there must be a change of conveyance. Then, after filling the cane-yard with canes, the engine is to be attached to the mill and grind them; but if the power be only sufficient for ploughing, it will not be sufficient for grinding the canes; or, if the engine be made powerful enough for grinding the canes, there will be a waste of power when ploughing and bringing home the canes.

How is manure to be obtained if all the work is done by steam? I need only mention another consideration, which to those who have been in the habits of working engines, is of the greatest importance,—the procuring of coals and proper people to work the machinery and keep it in order,—how are these to be effected?

Perseverance and skill *may* overcome all these difficulties, but the question is, *at what cost* can it be done? From what I have stated above, I think it evident that the expense must be very heavy.

I do not wish to put any check upon skill and ingenuity; there is ample scope for the display of both at the works and manufactory, and in the introduction of agricultural implements; as witness Mr. Edie's horse hoe in Saint Andrew's; but from the difficulties I have above enumerated, I do not think it will reach farther. If Mr. Whitty, however, has a mind to try what he can do, I will give him as data to make his calculations by, the cost of the cheapest system of cane cultivation by manual labour, that I know of in this country; it is two pounds ten shillings a ton for cane cultivation, without expense of manufacture, watchmen, tradesmen, or any other expense than cultivation alone. Let him calculate at what reduced cost he can do it by steam. As I am a competitor for the Governor's prize, I cannot inform him of the lowest cost by agricultural implements, but it will be considerably below that.

By the bye, what success attended the cane-cutting machine; we have never yet heard the result? A cane-piece of standing up canes might be mown down, but the long-top could not be cut off at the right place by machinery. I think a piece of lodged and crooked canes would be a puzzler to a machine.

AGRICOLA.

REVIEW

OF

"REMARKS ON THE CULTIVATION OF THE SUGAR-CANE IN THE ISLAND OF CEYLON."

"BY J. LAMBERT."

TO THE EDITOR OF THE JAMAICA STANDARD.

November, 1842.

THIS little pamphlet will be read with great interest by the planters of this Island, a strong effort being made at the present time to push forward Ceylon as our rival in the production of sugar.

It is our duty to keep a watchful eye upon all such undertakings, and to push forward with equal vigour, and if possible, maintain our position a-head of them. To do this with effect, it is necessary to know what our competitors are about, and on which grounds they expect to excel us; this pamphlet happily furnishes us with many of the necessary details.

In reviewing the work, I shall endeavour to draw public attention to several points upon which, I think, we may take a hint for our own improvement, and which, on a casual perusal, might be passed over unnoticed. Those parts of the systems of our opponents which differ from our own, should always be carefully examined into, for the purpose of seeing if useful hints may be obtained for our own guidance and improvement.

Before noticing these minor points, I shall take a general review of the circumstances in favor of the rival colonies of the East and West, and, after so doing, I think the difference in favor of the East will be found much less than is usually supposed, and such as to induce us not to give way to despondency under our difficulties, but as true-born and industrious Britons, to grapple with adversity, until success crowns our efforts.

First, with regard to the Land. Our land and theirs are similar in one respect, they both require manure. That our own land requires manure every body knows, but the common opinion that it is worn out is certainly erroneous: true, it has been badly used, but it is still capable, under good management, of being made as fertile as ever it was. If land cannot be kept in heart, how is it that the land of England that has been in constant cultivation for hundreds of years is now, on well managed farms, in better condition than ever? The restoration of our soil is comprised in two words, plough and manure. It is generally supposed, however, that the land of Ceylon is exceedingly rich; such is not the case; the author of the pamphlet gives particular directions with regard to manuring, and deprecates the idea of constantly changing the cane field as the land wears out. Dr. Ure, in his geology, states, casually, that the soil of Ceylon is not rich on account of the geological structure of the Island, the rocks being of primitive formation. The Penny Cyclopædia, article Ceylon, states; "The natural soils seldom contain more than three per cent of vegetable matter." I have it also on the authority of a friend now resident there, that the soil requires much manure. They have also the trouble and expense of clearing off the land, and making roads to their plantations, whilst we have no such difficulties to contend with.

Next as to Buildings. We have all ready; they have them to erect, and, although they will not put up such expensive ones as ours, they must go to a considerable outlay; the author estimates £4,500.

As to freight; they, having twice the length of voyage, must pay a higher freight.

As to produce per acre; the author estimates the average return at thirty cwt. of sugar per acre, if all the ploughings, manurings, and irrigations, that he prescribes are performed. Our lands would certainly give the same return with the same ploughing and manuring, leaving out the irrigation.

The elephants also are troublesome in destroying their crops, a mischief we are, happily, free from.

The only point then in which they are likely to excel us is in the lower rate of wages they are subject to: this the author calculates at from 7d. to 9d. a-day, which is certainly greatly in their favor, though not so much as we have been led to believe; whilst ours ranges from 1s. to 2s. From the more favorable turn that the immigration from Sierra Leone has lately taken, we may expect however to carry on our operations with more facility, although the rate of wages is not likely to be reduced. On the other hand settlers there have to break in the people to new habits, and to learn a new language themselves.

I have thus endeavoured to show the main points of comparison between the two colonies, and I trust it is so far favorable to our Island, as to prevent parties from giving up the contest in despair: there is no use however concealing the fact that our utmost exertions are necessary for a successful competition.

I shall now proceed to consider the minor points of the pamphlet; and from which I hope we may gain some useful information.

In the introductory remark, the author states, " What follows is the result of nearly fifteen years of practical experience in the culture of the cane and manufacture of its products, in the South of Europe, under a rental of £4 *per acre* per annum, with *free labour*, (the wages he afterwards states at 10d. a-day for field work), and with an average produce of 4500*lbs. sugar per acre.*

Planting.—He recommends the end of April, so that the canes may be cut off the ground before the excessive rains of May and June. This he says will be late enough to prevent the canes arrowing [in October.] Once past the period of arrowing, " the cane," he says, " will push forward with amazing vigour, and in March or April following will be fit to cut." Quick work that, cutting plants at eleven months old!

Stock.—The author insists strongly upon the proper feeding of the stock both in and out of crop ;—the feeding of them on hay made from the leaves of the Indian corn (which we waste) instead of Guinea grass, which at one period is so dry as to contain no nourishment, and at another so rank as to be purgative. He also recommends a feed or two of corn daily when there is no hay. I think we have great room for improvement in the feeding of stock; a much fewer number would do the work required if well fed and attended to.

Manure.—He insists upon keeping in a permanent cane field, and manuring it, instead of going upon fresh land and wearing it out as commonly done there. He says, "it would become no trifling item of expense to cart two or three thousand tons of canes two or three miles." Do not we also carry that system to too great an extent?

Field Cultivation.—This part shows the defects of our own system of management so effectually that I cannot do better than transcribe it.:

" Hitherto, when land has been taken in for canes, nothing more than opening a trench in the hard ground and putting in the plants has been done.

"As I have before remarked, the productiveness of the soil is extraordinary, and every thing that can be expected, [and more than ought to be expected,] is produced; the canes are cut twelve months afterwards—the trash remains on the field, and no attention is paid to the ground for some time, when at last a tardy raking together of the trash takes place; in the meantime, ants, vermin of every description, luxuriate in this refuse, deposit their progeny or eggs, and the first food they find is composed of the nascent shoots of the rattoons; the plant is thus left to the tender mercies of every thing that can possibly be injurious to it, whilst it is struggling to force its way through a trampled surface, and endeavouring to derive nourishment from a soil hard as a brick; and the same system is continued until the lapse of three or four years finds an unproductive stole; whilst had culture been employed, these very stoles would have continued to produce canes of an average crop for ten years at least. It must, however, be acknowledged in this place, that experiments only have been made, and the endeavour to produce canes at the lowest possible cost seems to have guided these experiments, and it is a matter of wonder only explained by the extreme fertility of the soil, that the results have been so highly satisfactory: but how infinitely more so would they have been had the plough, the hoe, and the manure been made use of, in order to do the justice accorded to every crop in every part of the world! [How truly does this portray the picture of Jamaica!] The remedy we shall name by and by.

Following the order of the pamphlet, the next thing is the method of working cattle. "They ought to be yoked by the heads as in the south of France and in all the Peninsula, the animal has one third more power with this yoke than when drawing from the neck or collar; for not only is his whole weight applied to the loads, but the immense muscular power of the neck is exerted to overcome any obstacle." This plan is strongly recommended in the work on "Cattle," by the Society for diffusing useful knowledge; perhaps some of your readers may have tried the experiment, and will favor the public with the result.

THE USE OF THE PLOUGH.—On this point there are few who are now incredulous as to the benefit resulting from it. "Whenever practicable, the plough should be used, the saving is very great, and the work done infinitely more efficient than can be the case with the miserable tools in use in the island, called Mamooties" (a species of hoe.)

Cane-Holes.—He recommends *five* ploughings previous to making the cane-hole with a double mould board plough; and as to the middle of the holes, he proposes almost the same plan that I proposed here some time ago, namely eight feet rows. He says, "Various opinions are maintained respecting the width of trench and bank, many giving them *each* three, and even four feet. I am inclined to prefer the convenience it affords for ploughing, and manuring and cleaning." He plants three feet apart along the rows, either one, two, or three tops being placed together, according to the quality of the soil.

In the course of irrigation proposed, we of course cannot follow him.

Ratoon Cultivation.—"As soon as possible after the cane is cut and carried off, the trash must be raked into small heaps and burned on the field, and the plough set to work between the rows, and again across the intervals. Manure at the rate of thirty or forty loads per acre should then be thrown into the furrows and hoed in by hand, which operation at the same time loosens the soil around the stoles, and enables them to push out new shoots with facility."

Boiling.—After a caution against the excessive use of temper lime, he states, "Lime is not necessary to the making of sugar, and green juice, and that produced from rank canes, is much injured by it. I know several estates where it never has been heard of, yet they produce the finest quality, nor is the quantity deficient; and upon them the old system of sprinkling cold water upon the froth in the pans is still followed: this simple operation has the effect of bringing together the feculencies which have escaped the process of clarifying." This, at any rate, appears worthy of a trial, it is so simple. By reducing the quantity of temper the colour of the sugar is undoubtedly improved, and if good sugar can be made by sprinkling the liquor with cold water, instead of using lime it would be a decided improvement. The author recommends Dutrone's plan of allowing the liquor after being boiled into a syrup to stand in a cistern for 24 hours for the feculencies to subside; this for several reasons is not adviseable. Passing it over, therefore, we come to the concentration, which he recommends to be done with a Kneller's teache. "Concentration by vaccuum is undoubtedly the best method of concluding the process of making sugar, but the expense of the apparatus, and its complication, can never permit it to be generally used; the substitution of Kneller's teache, will, however, answer very nearly the same purpose. The temperature necessary never exceeds 180 degrees, and the chrystals are large and bold." I am not aware if any of these teaches have been imported, and, as they are not generally known, I will give the description of them from "Porter on the Sugar Cane." "The apparatus consists of a set of pipes which are inserted in the liquor to be concentrated, and which reach nearly to the bottom of the pan. Through these pipes air is forced by means of bellows or any other blowing contrivance, and this air, escaping through the fluid, serves at once to reduce its temperature and to carry off the watery vapour with much greater rapidity than where the strongest heat is applied, under the most favorable circumstances, but without this operation." Now, though few estates are inclined to import new teaches, could we not obtain the effect at a trifling cost with the present teache, using either a powerful pair of smith's bellows or a modification of the fanner used by coffee planters. If found to answer on trial, it might easily be connected by gearing so as to be worked by the water wheel or engine. In potting sugar, Dutrone's plan is recommended, but it is not likely to be adopted here.

STILL RECOMMENDED. "A modern improvement in distillation, invented by Mr. Eneas Coffey, permits this operation to be performed at a saving of three-fourths of the fuel consumed by any other process, and no water is required for condensation, which is effected by means of the wash itself." This may be a useful hint to parties ordering new stills, but as the generality of estates are not likely to adopt it, it is not necessary to enter into a description of it.

WAGES.—The author calculates the cost of cultivating an acre of plants without irrigation at £5 5s. 7½d.; of an acre of rattoons at £4 10s. 5d. including manure; wages being reckoned 7d. a-day. The expense per day, for cutting, carting, and manufacturing, wages being 9d. for a double spell of people to keep the mill about day and night, and to make from four to five tons of sugar, £6 5s. 9d.

In conclusion, he states, "I see no reason to doubt an average produce of 30 cwt. per acre will be obtained; and this being the case no question exists upon profitable returns." I also, in conclusion, beg to state, that I see no reason to doubt obtaining similar results here if similar means are adopted to insure success.

AGRICOLA.

O'KEEFE'S DISTILLATION.

TO THE EDITOR OF THE JAMAICA STANDARD.

December 26, 1842.

SIR,—Allow me to answer "Perfer et Obdura's" mild and temperate letter in defence of the system of distillation introduced into practice by Mr. O'Keefe. I trust my answer may be characterised by the same good qualities which are the spirit in which these matters ought to be discussed.

My opponent is surprised that the alterations, he calls them improvements, proposed by Mr. O'Keefe, have not been sufficiently and fairly appreciated. I reply, that the plan has been tried by myself and many others in this district, with every wish and intention of carrying his objects fully into effect, more particularly by a friend of mine, an Irishman, who for the honor of his countryman was peculiarly anxious that success should attend the attempt. The plan was as fairly tried as it could possibly be, and has been given up by every body among my acquaintance, as a total failure. I had no great opinion of it at the outset: but I notwithstanding, gave it a fair trial, following his printed instructions, which must be supposed to contain the exact plan he wished pursued; by those instructions the plan was fully and fairly tried, and failed as I before mentioned, in every instance within my knowledge. I think, therefore, that we cannot be blamed for not having duly appreciated his plan; but on the contrary, I think we are to be praised for having so long withstood publicly expressing our dissent from the practice, and for affording Mr. O'Keefe an opportunity of trying the experiment for a length of time under his immediate superintendence, without any prejudice being shown against him. His plan has been generally abandoned for months in this quarter.

Am I then averse to giving him every encouragement in his undertaking? Quite the contrary, I think he should meet with every facility. Every intelligent man who devotes his attention to the improvement of our staple products should meet with due encouragement. I am of opinion that Mr. O'Keefe will in time find out correct methods for increasing the return of rum; he may even now have done so, for I do not pretend to know what system he may at present adopt; the probability is, that during the time he has been conducting the process under his own superintendence, he may have materially altered his plan of proceeding and improved accordingly, I can only speak of the plan he published about a year ago. I understand he has published in last week's *Journal*, testimonials as to the advantages of his system, but I have not seen them. If these testimonials prove that he is a successful distiller, they merely prove, that he is able to conduct the process himself, but unable to instruct others how to do so.

My opponent states, that Mr. O'Keefe merely adopts the best systems practised in Great Britain and on the Continent, and that condemning those practices, we condemn the best practical distillers in the World. Now, the practices adopted in Great Britain are not by any means good; unfortunately the law steps in, and says to Mr. Distiller, "for the convenience of collecting the revenue, you must do as I order you, and not follow the dictates of your own knowledge and skill, however beneficial they might prove;" to look to Great Britain, therefore, for the best examples, is like asking a man with his hands tied behind him, to help you out of difficulty. To France you must turn for the best examples of theory and practice combined, for there the parties are unrestricted. These results you may find in *Dubrunfaut*,—a work which contains all the best methods practised, and which are far superior to the English.

O'Keefe it seems identifies himself with the best systems practised in Great Britain and on the Continent, and therefore condemning O'Keefe is condemning the whole host of practical dissillers in the old world. It may be considered presumptuous in me to enter the lists against such antagonists; but yet I venture to affirm that the best of them would find their plans not suited to our circumstances, and would be obliged materially to modify them. I have carefully studied *Dubrunfaut*, and have tried the plans recommended according to the best of my abilities. At the very time that O'Keefe brought forward his first letter in the papers, I was trying them, and apparently with great success. I have, however, since found out my errors, and, as I believe, the causes of the failure.—Upon the same rock that I split, I contend that O'Keefe (according to his printed instructions) has also split, and will continue to do so until he changes the system. This failure has not discouraged me from prosecuting the enquiry, and I presume it will not deter him. I have for years pursued the study, with the determination to bring it to a successful termination: not by the rule of thumb, but by studying the theory and practice in all their branches.

I have latterly conducted a series of experiments for a considerable time, founded on the plan I considered best suited to us, with great attention to all the circumstances, and accurately registered by instruments, and I must say with very great success.—I shall refrain at present from saying more on the subject, until I have confirmed my opinions by further trials. Those who have endeavoured to establish the system on scientific principles will be able to appreciate my motives for taking longer to prove the truth of my theory; there are such a number of circumstances to be taken into consideration that it takes a long series of trials to place the theory on a sure foundation: and I consider that until the theory is known, the publication of a system, successful in one place might only mislead other parties for want of the knowledge necessary to alter the plan according to circumstances.

I perceive from what "Perfer et Obdura" states about dunder that he does not understand the reason why the use of it is beneficial; I have never yet met with any work or any person who has been able to give me a rational explanation of the nature and use of it; I do not know that I have as yet been able myself to get over this "pons asinorum"; I have, however, formed an opinion on it, and which opinion seems borne out by facts, but I must give it a longer trial before publishing it.

In conclusion, I beg to state, that I may not be misunderstood, that no part of what I have written relates to the fermentation of Raw Liquor or cane juice, which is seldom practised, but to the every day management of the still house. I have never had occasion to try fermenting cane juice by O'Keefe's plan.

As my opponent states that others are prepared with unquestionable proofs as to the advantages derived from O'Keefe's plan, in opposition to any parties who may disapprove of his system, I hope that, for the satisfaction of all parties, he will produce them. "Audi alteram partem"; they will meet with due attention from all planters, and amongst others,

AGRICOLA.

P. S.—I see there is another candidate in the field; "in the multitude of counsellors there is wisdom"; amongst so many Doctors distillation ought soon to become perfect.

SUGAR BOILING.

TO THE EDITOR OF THE JAMAICA STANDARD.

January 2, 1843.

As a practical planter, allow me to have my "say," on the plans proposed lately in your paper on the above subject by "Nunc pro Tunc" and "Saccharometer."

Saccharometer says he could improve sugar, and make it equal to single refined at one boiling, at a cost of two shillings per cwt.; I am afraid he will get nobody to place any confidence in his statement, as by his subsequent letters he shows such an utter ignorance of the subject he treats of, as to destroy all faith in his promises. In proof wh reof, witness his answers to Nunc's second letter, wherein he describes boiling with a fluid medium as boiling in a vacuum,—straining liquor as filtering, &c. I have therefore done with him.

Nunc pro Tunc is a different customer and deserves attention. The machine he recommends is a "filter, of the most simple construction, and of no great cost, which receives the cane liquor as it comes from the clarifiers, and delivers it at the rate of 700 gallons an hour, freed from every foreign matter, and reduced into '*sugar* and *water*, which chemical analysis shows cane-juice (for all practical purposes) to be. The intention of the patentee is, that the cane liquor should be boiled in a vacuum pan, where pure sugar would be made without one drop of molasses being formed, or the admixture of any impurity whatever." If this could be performed, it would be a grand thing, but the patentee will certainly find himself deceived. In the first place, upon trial, he will find that cane juice, however carefully filtered, will not prove to be sugar aud water, but a compound mixture containing vegetable albumen and gluten, a small quantity of acid, and probably some other matters. Vegetable albumen or gluten are contained in the sap of all canes, and in the juice of unripe canes, and partly separate on the application of heat and lime, and partly remain and form the unchristallizable sugar or molasses. Simple filtering, which is what he appears to recommend, as he does not mention that any thing in the filter is to act chemically, will never separate the ripe juice from the sap and the unripe juice; it will simply separate the small particles of the fibrous matter of the cane and other dirt mechanically suspended in the liquor. As the liquor does not consist of sugar and water, the remaining hope of being able to convert it entirely into sugar without molasses must fail.

To illustrate my meaning more fully, suppose a hogshead of sugar were dissolved in 2000 gallons of water, then a quantity of saw dust or fine dust put into it, and then a quantity of sand or earth :—if this mixture were subjected to the plan proposed, the expectations might be fulfilled ; the sand and sawdust would be entirely separated by a good filter, and the water being all evaporated in a vacuum pan, the sugar would all be recovered in the same state as before. But is this the process of sugar boiling in practice? Far from it.

Consider the constitution of the cane; the interior of it is a mass of cellular tissue ; there is a system of tubes throughout the whole length of the cane, filled with sap, ascending and descending; there is a system of cells between the sap vessels, in which the juice that makes sugar is deposited ; in ripe canes this juice in the cells may be supposed to be, and I believe does consist of, pure sugar and water. Now the sap is not pure water, neither is it sugar and water, but juices extracted from the earth on their way to and from the leaves, when what is suitable to the plant is chemically acted on by the atmosphere and afterwards assimilated by the plant ; the refuse being returned to the soil. Now, in squeezing canes in the mill, this juice, which certainly is not sugar and water, or any modification of them, must be pressed out along with the saccharine liquor, and cannot be separated mechanically by a filter, or be evaporated by boiling. How then is it to be separated from the liquor ? Again, there are always a quantity of canes ground, which are not fully ripe, and the juice of which cannot be considered as sugar and water, but rather an uncrystallizable sugar (namely molasses) and water.

In boiling sugar, the watery part of both the saccharine juice, and of the sap, evaporates; some of the albuminous parts of the sap and unripe canes separate on the application of heat, carrying with them the impurities mechanically suspended, and form the refuse after the clarified liquor has been drawn out of a pan ; further portions of the mechanical impurities are separated by straining, and some remain in all sugar made in the common process—a second portion of albuminous matter separates in the low coppers as the heat increases, and goes to the still-house as skimmings, and part remains in the syrup, and afterwards separates in the coolers from the sugar as molasses. Such is the common process—such must always be the case to a certain extent in the best process.

A filter may separate all the mechanical impurities, and the only question in the application of it is its cost, the ease with which it can be used, the length of time it will last, and its non-liability to become sour. These are the points which any person recommending their use should fully establish.

With regard to the use of the vacuum pans, there is no doubt of their success ; the question is simply their cost, difficulty of working, and liability of getting out of repair ; and for these reasons I do not think that they will ever come into use in this colony. I am aware that they are very generally in use in Demerara—that they improve the quality of the sugar two shillings a cwt. and that the sugar loses nothing in weight on the voyage home ; great advantages certainly—but still, for the reasons mentioned above, I do not think they will come into use here ; besides, estates here are on a much smaller scale, and less able to bear the outlay. But even if they do, it is evident that they cannot, from the constitution of cane juice, even in conjunction with the best filters, perfect the process without forming molasses. I readily allow that much less molasses will be formed, as in the common process of boiling sugar, much of the juice that ought to form pure sugar, is decomposed by the excessive heat, and converted into molasses.

"Nunc Tunc Iterumque" is misinformed, when he says that a vacuum pan was never introduced into this island. There was one erected and tried at Retreat Estate, in St. Thomas in the East, four or five years ago, as well as I recollect ; I saw it when erected—but previous to working; it was on a small scale; the pump was to be worked by a man; it was placed near the teache, but no fire was applied to it, and the intention was to boil the liquor into syrup in the teache, then to throw it into the vacuum pan, work the air pump, and finish the process by the heat which was in the syrup without any fresh application of heat. I never heard the result, but should expect a failure, as it was expecting too much from the pan—whether it has been tried by the application of fire or not, I don't know.

If Nunc, or the Patentee, can establish the points with regard to the advantageous use of the filter I have enumerated above, and show that it saves labour, they will meet with encouragement from the planters—but they must show the advantages as "clear as daylight," before they can expect it to be adopted. I am writing to Nunc as a new-comer to the country, from his stating that all the coppers could be supplied by a cock from the filter, and thus save labour; which operation, when he tries, will rather confound him.

Filtering syrup through animal charcoal has been tried and given up; the reason why, I do not know; but believe on account of the trouble and expence,—the colour of the sugar was much improved by the operation.

AGRICOLA.

Part 6th.

THE METAIRIE SYSTEM.

TO THE EDITOR OF THE STANDARD.

Jan, 1843.

The perusal of the paper on the above subject, read at the meeting of the Jamaica Society, published in your paper of the 12th has induced me to offer some remarks on the same subject.

The plan proposed is that an estate should be subdivided into several partitions or farms, with one set of works in common for all the metayers or sub-tenants; that the metayers, who are to be a superior class of labourers, are to cultivate their shares of the estate with a very trifling advance of wages, and are to be paid their share of the nett proceeds of the estate, having each had, according to the quantity of produce made, to bear his share of the general contingencies of the estate.

Now it appears to me that there are many insuperable objections to the plan. In the first place the middle men, or intermediate class who are to carry it into effect. are wanting. I do not know any estate where there are a sufficient number of people capable of entering into the arrangement, or in whom the common labourers would have confidence enough to wait till the sale of the produce at the end of the crop for their payment.

In the next place, with whom are the metayers to contract?—Certainly not with an overseer, who may be removed at any time, and who, if willing, has not the power to make the arrangement.—There is not a proprietor resident on more than one estate out of probably twenty, so that if even every resident proprietor adopted it, it could not be called a general system.

Again, there would be very great, I may almost say insuperable, difficulties to be overcome in the arrangement for the use of the works, several parties would want them at the same time; similar difficulties would also occur regarding the use of the stock, and in many other of the details.

Lastly, our hopes of improvement rest on the expectation of adopting more economical and more scientific modes of cultivation and manufacture, but are you to look for any change of this kind from a perfectly uneducated class?

Resident proprietors might beneficially adopt it on a smaller scale. Say a proprietor lives on a two hundred hogshead estate, and that he cultivates a field himself for 150 hogsheads, then as an auxiliary to his regular routine of work, he might give out land sufficient for 50 hogsheads amongst families living on the estate, who would live on their regular wages, and might be induced for the hope of profit to cultivate two or three acres of canes each, in their leisure hours, instead of working provision grounds for profit. But to simplify the matter to the labourers, who require their bargains to be very clear, the arrangement should be to pay a fixed sum for every hogshead of sugar, the proprietor paying the people cutting, carting, and manufacturing it. In this way it would be an useful auxiliary to the proprietor, but it would never do for him to depend for the whole crop on the system. This appears to be the plan adopted at St. Lucia, as published in your paper of the 5th.

Absent proprietors might possibly allow their agents here to enter into contracts at a fixed price per hogshead for all made, in addition to the regular crop of the estates, but being all merchants, or more or less concerned with them, they would never hear of produce being shared in kind.

If the metairie system be advisable, it appears to me that the overseer should be the metayer or middle man; he should contract with the proprietor, through his attorney here, to deliver the produce at a fixed rate per hogshead and puncheon, to cover all wages and contingencies; the attorney supplying him with funds as requisite, as at present. This would not interfere with any existing arrangement, which, in proposing anything new, it is quite necessary to ascertain, as were you to touch a man's pocket, you may be sure of strong opposition. The thing appears to be quite feasible. Suppose the overseer entered into the arrangement with the proprietor, according to the terms agreed upon by the attorney, to ship home by such vessels as he ordered, all the produce to the usual merchants, at, say, £12 for every hogshead, and £6 for every puncheon,—the attorney would still be paid his usual commission,—would visit the estate occasionally, to see that the conditions were fairly fulfilled, would, as the crop progressed, make the necessary advances, taking care to be on the safe side; and would purchase the usual number of stock, order the usual supplies, &c. till the end of the crop, when he would pay the overseer or metayer the balance due to him.

The overseer having a direct interest in the estate, would exert himself to the utmost to increase the crop—for it is well known that the larger the crop, the less expense is incurred in proportion to the hogshead; he would introduce every feasible method for saving labour and expence, and would be obliged to cultivate the good-will and affection of the labourers. He would then stand in the place of the proprietor, and would introduce a kind of metayer system with the labourers for their spare time; and then, being taught the most economical methods whilst working for him, would introduce them by degrees likewise into their own patches. He would have no difficulty in getting individuals to agree to clean 10 or 20 acres at fixed times for specified sums, until brought to perfection; he would also be able to get, as is now commonly done, some influential man to undertake the management of the manufacture of the produce at a certain sum per hhd.; he would also get his stock attended by contract; in fact, he might plough his fields and do all his work in this way; so that at the beginning of every crop he could make his calculations as to the terms on which he could reasonably expect to do the work. He should be liable to the extent of half his salary, to make good any sum he might exceed the specified amount, except in case of such accidents as fire, hurricane, or other cause that could not be foreseen or avoided, and to be judged a sufficient excuse by the resident attorney.

The whole bargain might be called a limited partnership; it would not amount to renting. The bargain would be renewable every year. The proprietor would know that every exertion possible would be made to send the produce at the specified rates, and that it could only fail through unavoidable accidents, and then his outlay would be far less than it would be under an accident under present arrangements, as he would have benefitted by all the savings effected by the overseer up to the time of the accident. The overseer's berth should be considered secure, he should never be moved except for very cogent reasons; he would then marry and become one of a respectable middle class or yeomen so much wanted in the Island.

The proprietor would reap greater profits than at present; the attorney as much or more than at present; and the overseer would have the chance of making a profit also by the exercise of his industry and skill. The laborer also would improve in industry and intelligence, and follow the good example set him by his employer, with whom he would find it his interest to keep on good terms.— The business would not be so hazardous as now, all parties looking forward to the future with a kind of certainty.

Attorneys are now interested in making the crops as large as possible, being generally paid a percentage on the gross value of the produce; the tendency of which arrangement is to make the sugar, even if it should leave the proprietor no profit. Overseers are generally considered of value in proportion to the largeness of their crops, and not to the economy of them; this tends also to increase the expenses. The proprietor and the merchant naturally wish the crops to be as large as possible; this also tends to raise the expenses. The labouring population also naturally wish to receive the utmost value for their labour. Thus the whole general arrangement at present tends to raise the cost of manufacturing our staple products, whilst the proprietor is almost totally in the dark as to the probable outlay for the ensuing crop, funds for which, however, he is obliged to advance, notwithstanding he is quite ignorant as to the probable return.

Now for the advantages of the proposed plan. The proprietor through his agent here comes to an amicable agreement with the overseer on the estate that the produce, barring accidents, shall not exceed in cost a fixed sum per cask. The proprietor therefore makes the necessary advances with a fair prospect of a sure return for his money. The interest of his attorney is still to give the necessary assistance to make the crop as large as possible; but mark the counteracting influence now opposed! The overseer now says, I will make the crop as large as possible, but I will also make it as cheap as possible. The subtenants also will do their utmost to make their small lots as productive as possible, and add their mite to the general welfare; year after year they will become more acquainted with the real value of produce, will become more and more industrious, extend their cultivation, and fulfill their bargains with more certainty and good faith: a kindly feeling will grow up between them and their employers; and all things will tend to general happiness and prosperity.

I seriously recommend this plan to the consideration of absent proprietors; it appears to embrace many and great advantages, and to have few disadvantages, in fact I do not know of any disadvantages beyond those attached to the present system.

Say that a crop of 200 hhds. is expected, and that the contingencies, including wages, purchase of stock, repair of buildings, English supplies, salaries, lumber, and all other Island expenses, are estimated, at a fair calculation, at £3000, or £15 a hhd. (leaving rum out of the question at present). The overseer, on making his calculations and agreements with the people at the beginning of the year, might feel inclined and able to undertake the crop at the rate of £14 a hhd. and still expect to make something comfortable in addition to his salary. The proprietor would have the probability of saving £1 a hhd. or in case of the overseer not fulfilling his contract would save half his salary, and besides would have spent less under his increased exertions than he would have done by the common arrangement. The attorney to be allowed to furnish silver, and pay accounts by monthly instalments, but only to the amount of two-thirds or three quarters of the contract, leaving the remainder for a general settlement at Christmas.

AGRICOLA.

THE METAIRIE SYSTEM.

TO THE EDITOR OF THE JAMAICA STANDARD.

January, 1843.

THERE is something in a name, and therefore I have chosen to continue the consideration of the plan proposed under the above title last week, still under the same name.

The Metairie System has been sanctioned by the Colonial Secretary, by our late revered Governor, who is a host in himself, and by many others anxious for the welfare of the colonies. Now my plan is not, correctly speaking, the Metairie system, but being founded upon that system, I think it better to continue the subject under the same title. The subject is one to which the attention of proprietors has been so strongly drawn, that it is sure to meet with attention.

Now, believing as I do, that the Metairie System cannot be generally carried into effect, however ardently wished, I thought it my duty to state the arguments against it publicly, to prevent parties injuring themselves by the trial; but yet, it being self-evident that something must be done to save proprietors from ruin, I felt called upon to propose in lieu of it what appeared to be the plan best calculated to effect that praiseworthy object: and most happy shall I be if it succeed in any degree in effecting the good contemplated. If the proposed plan is likely to fail, or to prove detrimental, instead of beneficial, to the interests of proprietors, it is here published in the face of the very parties who are to be the judges of its merits, and who are generally averse to all innovations, and are quick enough in finding out and opposing anything that interferes with their own interests. It is likely to be supported by those in this country who will more immediately reap the benefit of it, namely the overseers; but then, if likely to be injurious, its fallacy will be exposed by the resident proprietors out of good-will to their own class; and also by attorneys, who are not fond of changes, and who are satisfied with the present arrangement. Thus its merits and defects are likely to be fully investigated.

It grieves me to the heart to see estates that ought to prove a source of affluence and comfort to families who have considered themselves wealthy in their possession, passing away, one after another, into the hands of strangers. Such things ought not to be—it was never contemplated by those benevolent individuals who lent their aid in passing the abolition act at home, that the liberation of the laborers from slavery should be the ruin of the proprietors. Having always been an advocate for freedom myself, I certainly shall do my share towards averting further ruin. I have always been of opinion, that ultimately the result of the experiment would be favorable, and I think so still; indeed, I had hoped that long ere now, things would have been going on prosperously. Many causes have arisen to frustrate and to delay that much hoped-for period; these causes it is useless to enter into, as they cannot be re-called; it is sufficient for our present purpose to know that our fortunes are at a deplorably low ebb, and that the greatest efforts must be made to improve them.

In this particular, I think everybody will agree, that 'something' must be done, and that quickly; but what is to be done, is the question in dispute. I have, on a previous occasion, expressed my opinion that success depends much more on the overseer, than on any other part of the machinery of an estate. He is the mainspring of the whole, and if the remaining machinery is good and well-regulated, is capable of having his power applied to much greater effect and profit than at present. He is at present the mainspring, but he is only half wound up, and is besides clogged with so much machinery, and that so stiff and unwieldly, that his power is neutralised—to speak more plainly, it is in his power to increase the crops, and reduce the expences very materially, if he is wound up to the full extent; that is, if it is made his interest so to do, and if some of the useless dead weight is taken away, that is if he be allowed greater liberty of action. This is the point that affects the proprietor—he wants larger crops at a smaller outlay.

By the present system, he will get larger crops, but his outlay will not be diminished—cannot be diminished, as it ought to be. To allow the natural course of events; the proprietor finds he is losing money—he writes to his attorney that such is the case—that the capital sunk is great—that the great part of the contingencies are as much for a small crop as a large one—that therefore he must increase the crop; at the same time he writes that the expenses must be reduced; he is answered that every effort will be made to increase the crops, as also to reduce the expence; but that he, the attorney, does not see how the latter can be done. The attorney informs the overseer that the crop must be increased—perhaps makes also the same observations that the expenses must be reduced—the overseer's answer is, that he will use every effort to increase the crop—but he does not see how the expences can be reduced, as he is obliged to pay the same prices as his neighbours. The overseer in his turn informs the labourers that the proprietor is losing money—that the crop must be increased, and the expences reduced. The people say they will do what they can to increase the crops, but that it is impossible they can work for less than they do. The crop is increased accordingly; the people receive the same, or perhaps increased wages as a stimulus to increased exertions, the other expences go on as before; the overseer maintains his situation, and perhaps reaps some credit for increasing the crop: the attorney pockets increased commissions; and the proprietor still makes nothing, or, perhaps, the standing contingencies bearing a smaller proportion to the larger crop than the smaller one, obtains a trifling return quite inadequate to the outlay. Absent proprietor, I appeal to you, if such does not agree with your experience? I ask you, if such should continue to be the case? Does not such a result deaden your hopes and your efforts under the prospect of still worse times by the proposed reduction of the differential duties?

Now, what are the causes that lead to these results? The proprietor equally gives instructions as to raising the crop and reducing the expenses: but why is the one part fulfilled the other not?—Self-interest assists in one case, but not in the other. I am not going to impute bad motives; it is human nature thus to act. The attorney is told to do two things; he is told to reduce the expences and increase the crops; he is in a dilemma; he is the ass between two bundles of hay; as regards the proprietor's interests it matters little which course he pursue, he cannot do both: if he set to work to reduce the outlay, he runs the chance of decreasing the crop; if he determine to increase the crop, he does it at the risk of increasing the wages and contingencies of as much as the increase of the crop, perhaps self-interest here guides him in his choice, and determines him to increase the crop; perhaps his motives are purely conscientious, and he thinks it the less evil of the two; the crop is however invariably increased. Having made up his mind he informs the overseer, and throws him into a similar dilemma by an order both to increase the crop and diminish the outlay; the overseer then has the choice of the two evils; he knows that if he attempts a reduction of wages he will in all probability lose a considerable part of his crop; on the other hand, if he does not increase the crop, he anticipates a ticket of leave of absence; this consideration soon settles his opinion on the question. The labourer has a still more powerful argument in favor of his own interests; he never believes that the proprietor loses money, he knows that the crop can't be made, without his assistance; he argues that his master would not ask him to make a larger crop if he were losing money, and he does not see why he should work one stiver cheaper; his determination is therefore soon come to, and of course goes with his self-interest;

Thus things go on, the question naturally arises whether an alteration cannot be effected; I say, decidedly it can; make the increase of the crop and the decrease of the expense the interest of parties here. The first plan that would suggest itself would be to pay the attorney a commission on the nett, instead of the gross proceeds: this would go a long way towards mending the matter, but it would be impracticable to enforce it, and it would not reach to the root of the evil; the interests of proprietors would be liable to great injury by neglecting the real interest of the estate for the temporary profits arising from the system, for instance the buildings might be allowed to go to ruin, the stock not be replaced, &c.

Let us now see how the system can be altered beneficially in the case of overseers. At present his life and situation are anything but enviable; he has no interest or inducement to exert his skill and ingenuity; as long as he does not do worse than his neighbours he is satisfied; he is the badger born to be baited; all ill humours are vented on him, no matter whether deserving or not; he may be discharged at any time without a cause; his allowance for house keeping is too small to support him in comfort; his salary reduced, but to this he would submit with willingness if he felt that his services were duly appreciated; no cheering word to keep up his spirits, when bearing the heat and burden of the day; and if he marry to soothe his evenings with social comfort and allay the irritations of his worried feelings, he is by too many a marked man, and considered unfit for employment, although he has every inducement on that account to extra exertion and attention in his duties. Such is at present an overseer: but change the circumstances, excite his self-interest, but make his interest and yours identical, put confidence in him, make his situation permanent whilst he continues deserving of it, and see what will be the effect. He then stands in the exact plac e of the proprietor; whatever affects the interest of the proprietor affects him; his profits and the proprietor's are both made in the same way; he feels himself at ease in mind and grateful for his condition, and exerts himself unceasingly for the interests of both parties. He is uncontrouled in his actions; his ingenuity and skill receive a spur; whatever improvement he can adopt or saving effect, a part of the profit enters his own pocket; he is now no longer the badger to be baited, but the farmer in the midst of his laborers, and is looked up to as a landlord by his tenants.

But it may be objected, how can he be able to effect a saving in expense any more than before. I answer in many ways; at present if he makes any alteration in the old system, he does it at his peril; however satisfied he may be of the nature of the improvement, his self-interest prompts him to decline doing it; if it succeed he gains nothing, not even thanks or credit; if it fail, the blame all lies at his door. There are many savings that may be effected without any outlay or any thing necessary, except personal trouble —but why should a man take a trouble upon himself without a profit or without honor; it is contrary to our nature to do so. There are many savings to be effected in the economical management of estates, in the manuring of land—in ploughing—in the method of cultivating the cane—in the cultivation of rattoons—in the manufacture of sugar, and in the distillation of rum, all of which may be effected by personal exertion, and would be so, if backed by self-interest, and to these savings would an overseer look chiefly for his recompence; but he would also be far more economical in ordering the necessary supplies, if his profit were dependent on the amount of them: he would take care there would be no wasteful expenditure of them; whilst, if he might be inclined to injure the capital of the estate by neglecting the buildings, &c. the attorney would then be the check on behalf of the proprietor, to see his interests protected.

In my last letter, I showed that the laborer was not the party to whom the proprietor could look for any improvement in altering the present unprofitable aspect of affairs; and I think I have now clearly shown the party best capable of effecting an improvement; it remains for the proprietors seriously to consider whether the attempt is likely to be attended with success, and what danger they run in adopting it; for my part, I see no disadvantages, but on the contrary, many and great inducements for a trial. If overseers were rich enough to rent the estates, it would, perhaps, be a better plan to rent them out; but they have not the means of carrying them on, and this plan seems to comprise most of the advantages of renting, combined with what advantages there are in the present system.

Man is a calculating animal, but overseers have not been called upon to exert much of their calculative powers. I therefore attach the heads of the different items that would have to be reckoned in making the bargain Almost every estate would differ in amount, but a very good approximation would be obtained by taking the calculations for the last year, with a prospect for the present year.

WAGES:—

FIELD WORK.	£	s	d
Ploughing or digging acres at £ per a.			
Planting and cleaning— times at -			
Cleaning acres rattoons— times at -			
Billing acres pastures twice at - -			
Repairing intervals & other odd jobs, say -			

MANUFACTURE.	£	s	d
Cutting, carting, and manufacturing hhds. at £ per hhd. -			
Getting fuel for ditto			
Making puns. rum, wood cutters, mulemen, and stillermen, at £— per pun. - - -			
Superintendents, at salary			
Carpenters,—work equal to the regular employment of men, 50 weeks at per day- -			
Coopers, making hhds. & heading up, at -			
Ditto puns. and bunging off, at - - -			
Ditto coopering vats before crop, &c. - -			
Masons, work for men, 50 weeks, at - -			
Smiths, ditto ditto ditto at			
Wainmen, carting produce, supplies, plant tops, &c.			

Regular work for men, at ·	£	s	d
Mulemen, supplying pen, &c. - -			
Cattlemen, 52 weeks, at per week - -			
Watchmen, men, at per week -			
Grasscutters, at per week			
Fencemakers, at per ditto			
Domestics, at per ditto			

CONTINGENCIES.	£	s	d
Overseer's salary -			
Bookkeeper's ditto -			
Allowance for house-keeping - -			
English supplies, cost reckoned from previous invoices - -			
R. Oak Staves thousand at £ - -			
White Oak ditto and heading - -			
White P. Boards thousand feet at £ -			
Shingles - -			
Repairs of buildings, mill-work, hanging coppers, &c. - -			
Taxes - -			
Purchase of stock -			
Wharfage -			
Attorney's commission			
Miscellaneous small accts. say - -			

Upon this basis let the calculation be carefully made, and fairly for the interests of both parties; divide the total sum by the number of hogsheads and puncheons that can reasonably be expected, and the result will be the amount at which the overseer might undertake the management; and let him be satisfied with the chance of a small profit, as he does not run the risk of any great loss. The bargain being renewable annually, as the crop increased and more economical systems were brought into play, the overseer would be able to take the contract cheaper, and the proprietor would gain in proportion. Let the proprietor however give the overseer a reasonable chance of profit in proportion to the chance of loss that he runs. I would almost undertake to say that in every case the overseer would offer to contract for the crop at a considerably less sum than what there is every prospect of the cost being at present.

This certainly appears to me to offer the best chance of success hitherto proposed, and as such, and feeling for the losses the proprietors have sustained, and are sustaining, I submit it to their notice. It is much to the advantage of a class of hard working and industrious overseers, but it is far more so to the interest of the proprietor.

AGRICOLA.

Part 7th.

JAMAICA AGRICULTURE.

TO THE EDITOR OF THE JAMAICA STANDARD.

Feb. 14, 1843.

In reading a work on British Agriculture a few days ago, I came upon a calculation of the means necessary for carrying on, to advantage, a farm at home; it stated, that it was requisite to have a man and a pair of horses for every sixty acres of arable land.—This induced me to examine our system of field cultivation, to see how far we are from coming up to the standard of good Farming at home.

In the time of slavery, it was usually reckoned that the crop should be one hogshead for each slave; now the employment of these slaves was usually about one third at field work; one third manufacturing the produce, and one third employed as tradesmen, domestics, watchmen, in the hospital, &c.; so that the real field labour amounted to about one man constantly employed to cultivate canes to make three hogsheads, and the usual yielding being, on an average, one hogshead for each acre of canes in cultivation, each man cultivated three acres. Now, supposing that we could manage to cultivate sixty, instead of three acres, with the labour of one man, what a change for the better would be effected. Who then would have to cry out, "I can't get labourers to do my work?"

At present, where the land is prepared for planting by the plough, and where only a small proportion of plants is put in, and the canes are cultivated by manual labour, a man may, under a good system, cultivate six acres; but I contend that the whole field cultivation may be accomplished by agricultural implements, and that a man, by means of them, may be able, with the assistance of a small boy and four cattle, to cultivate fifty or sixty acres of canes —yes, fifty or sixty acres of canes. I am almost afraid to trust the words to paper, not because I am afraid many will disbelieve the possibility of it. Not only will I say that such can be accomplished, but I will further say, that the produce will be much increased in consequence.

At present I am not considering the manufacturing department, but simply the field cultivation, and I state positively that such an improvement is possible.

The next question is, ' When is it likely to be carried into effect?" Echo answers, "when?" Under the present constitution of society, I am bound to say: "slowly, very slowly." The statement will be read by many and many; it will be read and wondered at, and forgotten. With what feelings would such a statement be received, though, if my proposed plan of farming out the crops to the Overseers were general; the blood would thrill through every vein in their bodies, at the prospect of success it holds out to them, and no rest would they take; until they knew every part of the proposed plan; it would be read, considered, studied, and adopted.

The perusal of this will afford joy to the heart of the desponding Proprietor, at the pleasing prospect it opens to view: he will say, ' if it is so good, adopt it immediately." This is easier said than done, nothing is more difficult, in the present constitution of society, than to effect a change in long established habits, however obvious the benefits to be derived; it requires a great degree of personal trouble and perseverance to carry it into effect, and the secret spring that calls these qualities into play is wanting. Under the present system, fifty years would scarcely be too long to allow for the plan becoming general; if the other portion of my proposition were adopted, five years would see it in full play; this is the difference between meum and tuum, my interest and your's.

From what I have heard of the reception of the plan, I am inclined to think it has been very favorably received by those whose opinion is of weight; but, I wish some of them, I mean resident Proprietors, would publicly express their views on the subject, whether in favor of, or in opposition to, the proposition, for the sake of their class at home.

I appeal to Proprietors as a matter of self-interest, and let them consider that self-interest will act upon us the same as upon themselves. In Demerara, some of the Proprietors have sold a share of the estates to intelligent Planters, who are to act as attorneys and overseers: no money is paid down for the share, but it is to be paid by degrees out of their share of the net proceeds. Here it is evident that the arrangement is based upon the plan of making the proprietors' and the managers' interests identical. I have also heard that some parties in this country have united their interests with the resident managers, by giving them a share of the nett proceeds of the properties in addition to the salaries: this also is playing upon their self-interest. If some have found out that such is the best way of securing their interests, why should not the rest follow out some such arrangement: and I think the one I have proposed, the simplest and the best.

A few words on the practicability of managing estates on an improved, on a British system of farming. "Skilful Jamaica Planter of the old school! You who stand A 1 in public estimation, mount your Pegasus, and take a ride with me. I will take you to somewhere about your antipodes, and land you amidst flourishing sugar estates." The first estate we alight upon belongs to a rich Dutchman, and has about two or three hundred acres of cane; and we ride up to the house, but no Dutchman meets our view, and we are politely received by one of the Celestials. Upon enquiry, he informs you that no Dutchman lives there. "Oh," you say, "then I presume you are his Overseer;" "no, sir," answers Brother of the Moon, "I rent the estate, and will be happy to show you round it; and I hope to receive some useful knowledge from you Jamaica gentlemen, who are reputed to be first rate sugar planters." We proceed accordingly to take a ride round the canefield. Your first exclamation is, "what a large field of plants you have got in." "No, sir," says the Celestial, "we put in a very small field." "How can that be? I see nothing but plants." "We have not come to the plants yet, sir.' 'Not got to the plants yet! why, then, what are all these canes we are riding through?' 'Oh! these canes; they are only some of my old rattoons.' 'Impossible! They look just like plants; but hold! what's that again? here are cattle amongst your canes; what are they doing there?" 'Only ploughing, sir.' 'Ploughing between growing canes! you astonish me, I never heard of such a thing.' Mr. Celestial answers, 'How, then do you manage to clean your canes?' 'Why, we get as many people as we can, thirty, or forty, or fifty, if we can, and put them to work with flat hoes to scrape the surface of the ground.' 'But that will only kill the weeds, how do you loosen the soil between the rows to make the canes grow strong and luxuriant?' 'Oh! as to that, we dont think that at all necessary.' 'But how then do you get your canes to rattoon?' 'They don't rattoon with us, they seldom last longer than three years.' 'How, then, do you get canes to make a decent crop?' 'Oh! there's where we are such excellent managers ; we dig plenty of caneholes, and plant a large field every year ; some of us plough the caneholes, but many of us still prefer the old plan of hiring forty or fifty men and women to dig trenches with their hoes for planting the canes in.' 'Well, I never heard of such a thing, and then call yourselves good planters' and hereupon, the Brother of the Moon falls into an immoderate fit of laughter.

Having ridden a little farther he shows us his land being prepared for planting with the plough, and other fields of plants in the process of weeding with Agricultural implements, much to the astonishment of Jamaica A. I.

We now propose to see his manufactory ; he informs us that his mill is not about, but politely escorts us to his neighbour Son of a Gun. "Walk into the boiling house gentlemen," says our new acquaintance, and in we walk. "What splendid coppers," says A. I. "and how beautifully they work ; they are immensely large, and how shallow they are." "Yes," says Son of a Gun, "we find the wider and shallower they are, the better they work, and we could not get our work done quick enough without we used them. "And how many hogsheads will you make this week ?" "Ask my deputy here, he contracts for the job of sugar-making, and will be able to inform you." Upon enquiry, he informs us that he is not doing so well this week, and will not be able to make more than twenty-five hogsheads, "25 hogsheads in a week,' says A. I. "why we can't make more than 8 or 10 in a week; are your people slaves ? we could seldom do that even when our people were slaves." "No, they are all free, but if you make such a small week's work, how do you get off your crop ?" says Celestial. "Why, in that matter, we keep working away all the year round, wet weather or dry, and often do not get through the crop by the end of the year." "But how can your deputy make money out of his contract ?" inquires Brother of the Moon. "We do not make the sugar by contract, but hire the labourers by the day ; and besides our machinery is not nearly so powerful in proportion to the extent of the crop as yours is ; but I like your way of contracting with the sugar boiler, and think it very advantageous ; but how long do you take for your crop ?" "We generally get through it in about eight weeks. But take a walk into the curing house, and see my process of boiling the sugar. This man is a skilful hand, and contracts for my crop by the cwt., and very nicely he conducts the operation." Upon inquiring how A. I. does the work, he is informed that the sugar is never clayed, and upon further inquiry, finds to his astonishment, that owing to our bad management we lose about one tenth of the weight of the sugar or molasses on the voyage home, in drainage.

We now ask to see his distillery: he informs us that he has none, but that he sells his molasses to his neighbour, Rum—Rum, who buys the molasses from all the neighbouring estates, and devotes his whole attention to the business; and is perfectly astonished that we should not do the same.

Celestial then takes us home to a comfortable repast, and asks us how it is possible that we can make money. A. I. then informs him that he is employed at a fixed salary, and gets the same whatever crop he makes. "But how is it possible, then, for the Proprietor to make money under such a ruinous system of management as your's appears to be?" "In that respect I must confess, to tell you the truth, I don't think he makes much money; but he is partially protected against competition in the sale of his produce, and he is talking about getting more labourers to help him to increase his crops.' 'But why does not he make a better use of those he already has? why does not be cultivate the cane as we do? it is impossible he can prosper otherwise.' Here the colloquy breaks up on my informing my companion that we must be off home, as we have a long way to go.— 'My dear Celestial,' says Jamaica A. I, 'I must return you my best thanks for the valuable instruction you have practically afforded me; I will tell my friends all I have seen, but I am afraid they will say, 'its a Traveller's Tale;' at any rate I will try it myself.'

Here my companion and I mounted our Pegasi, and shortly after found ourselves safely landed in our own country, and I left him to astonish the natives in his district, and retired to my own quiet corner of the island.

AGRICOLA.

JAMAICA AGRICULTURE.

TO THE EDITOR OF THE JAMAICA STANDARD.

February 22, 1843.

Permit me through the medium of your columns, to notice several agricultural articles that you have lately published.

The first is the inaugural address of Dr. Macfadyen to the Jamaica Society, which I intended to have noticed long ago : however, " better late than never."

I am happy to perceive that Agriculture is likely to take precedence, as it ought to do, of Horticulture in that Society. Why should the attention of such an intelligent society be frittered away on fruits and flowers when such a field of usefulness is open to them in the successful improvement of the staple products of the island. Horticulture is all very well in its way as an amusement, but Agriculture is the soul of the country, and a poor satisfaction it would be to know that fruits and flowers flourished, when sugar and coffee declined. The Doctor deserves great credit, if he is the first to broach the subject of agriculture. I trust the society will henceforth show that they are alive to the great advantages that agriculture may derive from the arts and sciences skilfully applied to it.

I quite agree with the Doctor that it is to improved systems of cultivation that we are to look for prosperity rather than to the assistance of immigration. We are too apt to follow the example of the waggoner to Hercules, calling for help, instead of putting our shoulders to the wheel.

Although many, too many, still adhere to the old system of digging instead of ploughing cane holes, thereby injuring not only themselves, but their neighbours, the advantages of using the plough are so generally acknowledged, even by those who are too indolent to adopt it, that it is unnecessary for me to repeat them.—The Doctor, on the recommendation of the Marquis of Tweeddale, gives the preference to Small's wooden swing plough. With all due deference to him, I think Wilkie's iron wheel ploughs better suited for our circumstances. Wilkie's is much longer in the body, and, a plough being simply a wedge to be forced into the ground, the longer the wedge the easier it must penetrate and overcome the resistance. Small's is probably long enough for constantly cultivated soils, but for our soil, which binds very hard and compact from lying so long unworked, the longer the plough the better. The wheel also, although it slightly increases the draught, is a great relief to the person holding the stilts, which is a great matter in this country.

Edie's horse hoe is very well suited for the soil it is used on, which is mould with a mixture of fine gravel, and of a light texture. The gravel keeps the instrument clean, but if used on a clay soil it will be apt to clog. Edie's horse hoe is a combination of the parts of two different English hoes into one, and he deserves credit for the successful introduction of the machine. It appears to be used only for the cultivation of plant canes; but our chief want is a better system of cultivating ratoons to do away with the necessity of planting. It also wants a method of raising the earth out of the ground: this is done in Kirkwood's grubber, by a beautiful application of the principle of the lever, a plan of which I have sent to Mr. Matcham. I have also given him a plan of a horse hoe, which will be more generally useful in the cultivation of both plants and rattoons, and which, in combination with the little one-horse plough, will form my chief implements in my proposed plan of cane cultivation. Those who take an interest in the matter, are welcome to inspect it, or make similar ones. I have ordered it to be made as light as possible, to be worked by two cattle in any soil; I must therefore, warn parties wishing to use it, it is only to be used after the land has been fallowed, either by the large plough in the preparation for plants, or by tbe little plough in the cultivation of rattoons, and therefore they must not attempt to use it in the cultivation of hard unworked soil, and with six or eight cattle.

Edie's nose-ring for cattle is very good.

With regard to the arrowing of the cane. The Doctor conceives that the arrow withdraws some of the saccharine matter from the cane, from the well-known fact that the cane is not saccharine during the arrowing, and suggests that the loss of saccharine matter might be prevented by cutting the tops off. Now, although the suggestion would be found impracticable, still it is a matter of importance to understand the vegetable economy of the cane; I will, therefore, suggest to the Doctor, for his consideration, my view of the subject. The arrowing takes place during the rainy season, and is caused by the large supply of water. Now, is it not probable that what is considered the deficiency of saccharine matter in the cane, is simply that the saccharine matter is diluted with the large quantity of sap in circulation, and not that the quantity is really decreased? In this view of the case it would be expected that the cane would, to all appearance, become again saccharine, when the rainy season ceased, and so it does; for, on the drying of the arrow, which takes place when the weather becomes again dry, the cane is said to yield well, or to contain a larger quantity of saccharine matter. A wain load of canes in the arrowing season might, on expression, yield 200 gallons of cane juice, and after the arrow dried only 100, and in each case contain the same real amount of sugar; in the one case the cane juice would be called saccharine, in the other not; and, as we are in the habit of reckoning the number of gallons taken to make a hogshead of sugar, and not the quantity of canes ground, I am not prepared to say whether the canes do or do not contain the same real amount of sweet in both cases. It is a question however, worthy of investigation. From the study of Liebig, I am inclined to think that the growth of the arrow does not proceed from the saccharine matter deposited in the joints of the cane, but that the deposit of sugar in each joint is the provision of nature for the bud attached to it, and that the cutting off of the arrow would only have the effect of developing the buds, and withdrawing the sugar for their nourishment. I wish the President, and other members of the Society, would turn their attention to the subject of the vegetable economy of the cane, and the dep sit of saccharine matter. The utility or inutility of the practice of trashing canes depends on this. My view of the matter, from reading Liebig, is this, that the last function performed by each leaf, previous to withering, is the deposit of sugar for the nourishment of the bud belonging to the joint, and therefore it is clearly wrong to strip off the leaves previous to their becoming perfectly dry. But in what way does the deposit take place? Porter states that it is deposited in cells, similar to honey comb, unconnected with the system of sap vessels; if such be the case, the quantity of sugar should not be effected by the weather, as I have suggested above in the case of arrowing.—I conceive that each leaf brings its own joint to perfection, and that the sugar then remains there uninfluenced by any change till the cane is crushed, or the bud sprouts, or the cane decays naturally. Is such the case? As the cultivation of the cane, in so far as trashing is concerned, depends on the solution of this point, I hope I may not be considered troublesome by pressing it on the attention of the members. I think the matter might be easily ascertained by fixing one end of a cane in the receiver of an air pump, and creating a vacuum ; the sap would then, I conceive, flow out, leaving the saccharine matter deposited in the cells.

The Doctor concludes his address with calling attention to manures, and proposes the use of guano, bone-dust, nitrate of soda and of potass. I believe that all these, except in small quantities in the dry districts of Liguanea and Vere, will be found injurious: they encourage the growth of the vegetable part, without adding to the saccharine developement. I conceive the cultivation of the cane to be essentially forest or orchard cultivation, in opposition to the system of corn and vegetable food cultivation; in the latter crops the quantity of azotised matter is wished to be increased as much as possible, to increase the nutritive power; in the former the carbonaceous part and the saccharine part, (which is essentially carbonaceous,) are the objects to be encouraged : the two methods are therefore diametrically opposite. On the other hand, for our other staple, coffee, as it contains a large quantity of nitrogen in the berry, all the manures suitable for increasing the quantity and nutritive power of corn crops, are the proper manures, the object being to increase the quantity of azotised matter. And for this purpose, charcoal stands pre-eminently high, and may be had in inexhaustible quantities at a small cost. If this theory prove correct, it follows, from Liebig, that animal manures are injurious to the cane, but beneficial to coffee.

As the Doctor hints that on a future occasion he may enter into the subject more fully, I hope he may be induced to dilate on the above subjects.

My next notice must be of a young Planter in your paper of the 7th Feb. He is inclined to study Geology by way of arriving at a knowledge of the best means of cultivating the cane. To him I would say, "study it, by all means study it, knowledge is always useful," but I would first recommend him to procure Liebig's Organic Chemistry, and study it ; it will open a new world to his view.

Contrary to his expectation, I must inform him that my opinion is, that cane-land never wears out, but that land that has once borne good canes may at any time be made to bear good canes again by good cultivation. Liebig proves that any crop may be repeated for any length of time by returning to the soil what is taken away, and by converting the excrements of the plant into nutritive matter, by ploughing and exposure to the atmosphere, Now the excrements of the cane may be easily converted into nutritive instead of injurious matter, by the use of agricultural implements; the only question then is, how are you to return what you carry away. The cane is the part carried away, and consists of organic and inorganic matters. The organic matters are either kept in the shape of sugar, or dissipated in making fire with the trash to boil the sugar; but the whole of the inorganic matters are contained in the stoke-hole ashes, and may be collected and returned to the soil. The only part wanting, then, is the inorganic matter, and this need not be returned, as the atmosphere and rain are inexhaustible sources of it, and supply to the plant all that is required.

I hope I have simplified the matter to the young Planter; and let me advise him to put in small a field of canes, as near to the Works as possible, and to keep it in a high state of garden cultivation. After the competition for the Governor's prize, he may hear further on the subject from me.

As my letter has turned out longer than I expected, your other correspondents must form the subject of another letter.

AGRICOLA.

Believing the following to be a most valuable paper, I have taken the liberty, for the public good, of publishing it amongst my letters, and trust the author will excuse the act :—

ON SUGAR MANUFACTURE.

[Read before the Agricultural and Horticultural Society of Jamaica, by Mr. Churchill, on Monday, the 13th Feb., 1843.]

It was my original intention to have had the pleasure of reading before you this evening a paper on the Theory of Sugar-making ; but, on entering on the task, I found that dilating on the Theory would be uninteresting, besides being, for practical purposes, useless and unprofitable. I preferred, therefore, offering for your acceptance a few observations on the *practice*, as it is at present carried out in this island, and recommending for adoption some suggestions that have at one time or another been proposed by various individuals for the improvement of this important branch of manufacture.

In this paper, you will have cause to regret my want of that *practical* knowledge which *must* be necessary to every one who would undertake a *perfect* essay on such a subject as sugar making. Still, I trust I need not ask pardon for obtruding the subject on your attention ; for although the *practice* is daily carried on in this island, I yet imagine that the desired end would be attained much more advantageously and satisfactorily to every proprietor, if the Theory were better understood. Therefore, at the onset, I must remind you, that I profess not to treat on what may be the true practical routine of the boiling house, but to lay before you such observations on it, as from a careful examination into the constituents of the cane juice, and a knowledge of the peculiar properties of these constituents, would probably be drawn out on the portfolio of a book chemist.

The Sap of the ripe cane consists of little else than sugar and water—hence its having been for very many years the chief source of the sugar used for domestic purposes. The "*little else*" contained in cane juice is *vegetable albumen*, *gluten*, *fecula*, and *co-*

louring matter: and although these substances form an amount of only about one part in every 250 parts of the juice, they are the grand stumbling block in our attempts to obtain sugar more directly, more pure, and in larger quantity than we do at present. Is it possible to separate these impediments, and leave us the sugar and water? If so, we easily do away with the latter encumbrance, and may obtain, at one operation, pure white sugar. To do this, is the problem.

Allow me to point out, very briefly, those chemical properties of the constituents of cane juice, which are brought into action during the customary process of sugar making.

1st. OF VEGETABLE ALBUMEN.—It is readily coagulated by heat; it is dissolved by caustic alkalis; its presence in vegetable liquids easily excites fermentation.

2ndly. OF GLUTEN.—It has a particularly strong affinity for colouring matter: alkalis dissolve gluten, when assisted by heat: *gluten* also acts as a ready ferment.

3rdly. THE FECULA.—It is soluble in water, and long ebullition converts it into a species of gum.

4thly. *Colouring Matter* easily combines with both acids and alkalis. It is almost always found attached to some other proximate principle, as albumen, fecula, gluten, &c.

One remark only on Sugar.—It has the property of dissolving *lime* even to the extent of half its own weight.

Now the process of sugar making generally adopted in Jamaica, I believe to be this:—The newly pressed cane-juice is first gently warmed, and a *guess* quantity of temper lime is well agitated with it. The liquor is then submitted to a greater heat, and the scum as it rises is removed. The evaporation of the water is urged on as swiftly as possible, and you soon perceive the effect of this evaporation by the liquor acquiring greater *consistency;* it becomes a syrup; you perceive, also, that it as rapidly acquires depth of colour: by and by it becomes so tenacious, that by putting a drop, between the thumb and finger, it may be drawn into threads. Here ends the boiling process, and you commence cooling: as the syrup cools, crystals form, and in the course of a short time you have a mass of crystals of sugar dispersed throughout what you may call a lake of molasses. Ry draining for a while in hogsheads, you separate a considerable portion of this molasses, and your sugar is shipped for the home market; during the voyage much more molasses filters out of each hogshead, and the merchant of Europe is well pleased if he stores 9-10 in weight of that which was shipped from here as Muscovado Sugar.

But, as I before observed, from *cane juice*, you should make *white sugar only*, I had not to mention *molasses* as a product. Whence, then, does it arise?—and why is our sugar always of a more or less brown colour? Evidently, because at the outset, you did not sufficiently free your liquor from the *albumen*, the *gluten*, and the *green fecula*, and also because you did not apply a judicious temperature to effect the evaporisation of the *water*. That you did not separate all the *albumen and gluten*, is probable, from the fact of the necessary addition of lime being merely *guessed* at—for every particle of lime you use beyond what is strictly necessary, dissolves a portion of the albumen and gluten, and carries them on throughout the process.

If any *fecula* remained in your liquor, it became converted by the heat into gum, and no substance so easily renders sugar uncrystallisable, as gum,—it unites with it, and no extent of evaporation can render the mixture crystallisable. The presence of these three extraneous matters in your syrup, at once accounts for the formation of the molasses, for experiment has proved, that by the addition of them, or of gum only, to the finest refined sugar, dissolved in water, renders that sugar uncrystallisable; makes it, in fact, molasses. Besides, the presence of the gluten excites a fermentation which undoubtedly increases the quantity of molasses during the voyage.—Gluten is well knewn as the strongest ferment, and that it is contained in all muscovado sugar, seems more than probable, from the fact that muscovado sugar, dissolved in water, enters into the vinous fermentation spontaneously; whereas refined sugar, dissolved in water, will not enter into this fermentation, till a ferment has been added.

Besides, Chemical examinations have proved, that molasses *always* contains gluten, gum, and saline salts, and Professor Daniel states,—that "*all raw sugars contain lime*;" and as I have stated that lime is the ready dissolvent of gluten and albumen, there cannot remain much mystery as to the origin of all the molasses. But I have been speaking of molasses as being *uncrystallizable*. As molasses—it is so; but by separating from it the extraneous matters of which I have spoken, refiners have recovered from molasses fully

65 per cent. of good, strong, crystallized sugar. As to the *colour* of muscovado sugar, it is in a great measure owing to the injudicious mode of evaporating the water.—At the temperature of boiling syrup,—a temperature, under ordinary atmospheric pressure, of about 225°F.,—the extraneous matters of which I have been speaking, become more or less charred. So, too, does the sugar itself: and on every occasion of *striking* the *teache*, the fire beneath necessarily scorches that portion which still adheres to the sides, and this scorched portion is dissolved by liquor with which the teache is replenished, and of course adds to its colour. It has been long since proved, that even syrups made of refined sugar are very susceptible of carbonisation by a rather high degree of heat. How much more, then, must that liquor be liable to carbonisation, which is contaminated with other vegetable matter. Much of the liquor undoubtedly escapes carbonisation; but there is formed a considerable quantity of that peculiar half-burnt substance, known as *caramel*,—a substance, which as a *colouring* matter, would from its richness, please the most thrifty brandy and port-wine makers: for a very small portion suffices to metamorphose what would otherwise be a hhd. of *fair* sugar, into a hhd. of that snuff-coloured stuff, bearing the *name* of sugar, which was lately offered by a Liverpool house, as manure for lands, and food for swine.

During the last few years, several plans have been suggested for improving the manufacture of sugar—but of these plans only *one* (that I am aware of) has been aimed at the fountain head, as the proper point at which to commence the improvement—of that I will speak presently. The plan which appears to have gained the greatest popularity, seems to be filtration, by various methods. The advocates for purifying cane-liquor by filtration seem to imagine, that, if they can produce a perfectly *colourless* liquor, that liquor must necessarily consist of merely sugar, and water, and consequently that their produce will be pure sugar, free from molasses. Their process is simple, and I heartily wish I could agree with them, as to the probability of their obtaining a favorable result. But let me ask them, what else can a filter effect, let it be constructed in what way soever it may, but remove from the liquor all solids that are suspended in it, and also free it from all the vegetable colouring matter with which it may be contaminated *at the time of filtration?* It is well known that matters perfectly *dissolved* in a fluid cannot be separated from that fluid by the mechanical operation of a filter—and it is equally well known that the sap of all trees and plants is a perfectly homogeneous fluid: let them contain gums, resins, or sugar, these bodies are in a dissolved state; therefore I cannot comprehend how the process of filtration can effect in the manufacture of sugar, the required perfection. But facts, I acknowledge, are stubborn things, and I must admit I have seen and made cane juice most perfectly limpid and colourless by a single filtration, and I have seen sugar which has been made from similar liquor—as white as single refined sugar. Still, I repeat, how they free their liquor from the gluten and mucilage (which, of necessity, must generate molasses) is, to me, unaccountable. But if the filterers and their *practice* be right, I, and the *Theory* of Chemists, as a matter of course, must be wrong.

It may very likely be asked, if *they* who so gratuitously find fault with the *present* method of sugar making, have any thing better to offer? I can only answer, I know not! But I conceive these are the *theoretical* views of *table* sugar-boilers:—they fancy—they believe, that sugar of a superior quality, in larger than the usual quantity, and at a cheaper cost in manufacturing can, and should be made by—first, correctly ascertaining at what moment of its growth the cane contains the largest quantity of saccharine matter: by using the best method of extracting from it *all* the juice:—by finding means of separating from this juice all extraneous matter—everything but the sugar and water: and then by driving off by the most approved and most rapid method of evaporation, all the superabundant water. If the former intentions can be effected, and if the latter process be carried out perfectly, what have you, as the result of these pains, but well crystallised, pure, though not, perhaps, loaf-sugar? Now, as a means of effecting their first object—that of freeing the liquor from extraneous matter, Chemists would probably adopt some such process, as that patented by Messrs. Terry & Parker, in 1838—the process to which I alluded, just before speaking of the filtering plans. They would coagulate the albumen by the immediate application of a moderate degree of heat—they would then resort to such metallic salts as would combine with the fecula and gluten, and form insoluble precipitates—(for experiments prove that many metallic salts have a powerful affinity for the proximate principles of vegetables.)—They would THEN very judiciously take advantage of the FILTER to produce *that colourless liquor*, which the PATENT *filter* ever does. Proceed thus far, and you certainly have no further difficulty than a due evaporation of the *water*. That this principle is good, and that a modification of it would be practicable, seems pretty evident from experiments that have been made on estates in this island. Cane juice, clarified by similar means, has been boiled down without *throwing up any scum*—a pretty good test of the purity of the liquor! Besides, our liquor no longer contains what are necessary constituents of molasses: therefore, though a little drainage (of the mother liquor) will of course take place during the curing, that drainage will not be uncrystallisable molasses—but only syrup, easily crystallisable by further evaporation ; and which may, therefore, be added to any succeeding quantity of liquor.

A subject which promises as fertile a field for improvement in practical sugar boiling as any other—is that of *Evaporation*—its laws, I fear, are not sufficiently understood, or, at least, not sufficiently attended to. I cannot enter deeply enough into this very interesting and all important subject in my present limited space,—it is a subject worthy of our most serious attention : and might form an interesting essay of itself. As I have already suggested—give us but pure Sugar and Water, and, by proper means, that is by a perfect knowledge of the *laws of evaporation*,—you can procure, without doubt, by one operation, *pure sugar.*

The present mode of boiling the syrup is very objectionable.—Be your syrup ever so pure, a portion of it cannot escape carbonisation, and thus does the whole become coloured. The Vacuum Pan is undoubtedly the very best vessel in which you can finish the concentration of the juice (for of course it might be first considerably reduced in bulk by evaporation over naked fires.)—(*See note* 1.) After the liquor reaches the Vacuum Pan it does not attain a higher temperature than from 132° to 150° Fahrenheit ; therefore no carbonisation can ensue. But the liquor might be evaporated at a considerably higher temperature without detriment to the quality of the produce ; therefore, as the only two objections to Vacuum Pans, I have met with are, the expense, and the difficulty of managing them, may not some more simple means on the Vacuum principle be rendered practicable ? Dr. Ure, in his Dictionary of Agriculture and Manufactures, (p. 446, 2nd Edition) gives a detailed discription of an Apparatus for boiling under a *practical* Vacuum—the boiler is of similar shape to the usual estate still, but the lower half is encased in an air-tight vessel, and somewhat larger than the boiler to admit of the liquor being heated by a jacket of steam. A head, similar to those generally used on estates, is connected by

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NOTES.

(1.)—Since drawing up the foregoing paper an interesting communication by Mr. James Vallance on the subject of evaporation of cane juice *without fire*, addressed to the Editor of the Colonial Gazette, has been published in the Jamaica Standard (Feb. 9.) Mr. Vallance keeps his plan a secret for the present, but he professes to be able to convert cane juice into white sugar, without having recourse to *fire*, hence saving the trash—a most valuabe manure ; besides giving the manufacturer two and a third hogshelads of sugar in place of every one hogshead he now receives from his crop.

a pipe with the upper part of the boiling pan,—but the lower orifice of the pipe, instead of opening into the air is attached to a large air tight double vessel which is intended to be charged with steam. The interval between the two vessels is for the occasional supply of cold water. The communication between one part of the apparatus and another is prevented at will by the cocks. The working of that pan is very simple. Having half filled the boiler with liquor, and admitted around it a coating of steam; the *inner* vessel at the other extremity of the refrigerator is also filled with steam, which is immediately condensed by cold water suddenly admitted within its exterior casing. The condensation of the latter steam of course produces a partial vacuum, and the liquor boils and evaporates at a temperature considerably lower than under ordinary circumstances. This operation is frequently repeated, and boiling *at a low temperature* is kept up till the syrup is sufficiently concentrated for crystallisation. By referring to Dr. Ure's work, you will see a detailed description with a drawing of this apparatus. A modification of it might be useful in Sugar-boiling.—*(See note 2.)*

This brings me to a point which has lately been pretty widely discussed amongst Jamaica Planters. The means of expediting the evaporation of the cane liquor without the use of vacuum pans.—It was lately proposed to increase the evaporative power of the pans at present in use, by an improved method of setting them. The boilers were to be so hung that *a more effective heat*, (so I take it) was to be obtained from the USUAL *quantity of fuel.* Now,

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(2.)—I omitted to make the following quotation (as I intended to have done, from Ure's excellent paper on sugar-making—" Within these few years a very considerable quantity of sugar has been imported into Great Britain in the state of concentrated cane juice, containing nearly half its weight of granular sugar, along with more or less molasses, according to the care taken in the boiling operations. I was at first apprehensive that the syrup might undergo some change on the voyage; but among more than a hundred samples which I have analysed for the custom-house, I have not perceived any traces of fermentation.—Since sugar softens in its grain at each successive solution, whatever portion of the crop may be destined for the refiner, should upon no account be granulated in the Colonies; but should be transported in the state of a rich cane syrup to Europe. Were this means generally adopted, I am convinced that 30 per cent would be added to the home-made sugar loaves, corresponding to a given quantity of average cane juice: while 30 per cent, would be taken from the amount of molasses. The saccharine matter now lost by drainage from the hogsheads in the ships, amounting to from 10 to 15 per cent. would also be saved. The produce of the cane would, on this plan, require less labour in the colonies, and might be exported 5 or 6 weeks earlier than at present, because the period of drainage in the curing house would be spared."

from the evidence of many eye-witnesses of the trials made on these newly constructed furnaces, we have a right to believe that the rapidity of evaporation was increased; for by merely going through the *ordeal* of a *re-hanging*, the boilers certainly did effect what they never previously had done. But many estates it was said, could not take advantage of this improvement; for the fire was so brisk,—the draught so great, that (not to allude to the quizical tales of stokers having been drawn into the fire) many estates might find a difficulty in supplying a sufficiency of fuel. An experiment made on evaporation by Dr. Ure, goes far to prove that a strong brisk fire, produces so much greater a proportion of evaporation, than a more moderate fire, that the effect must be to economise fuel. Dr. Ure says:—" I set upon the top orifice of a small cylindrical stove, a hemispherical copper pan, containing 6lbs. of water at 60°f., and burned *briskly* under it 3½ lbs. coke in an hour. On burning the same weight of coke slowly in the same furnace, surmounted by the same pan, in the course of 12 hours, little more than one half the water was exhaled." Here we plainly see that the more we *accelerate* the combustion, the greater is the proportion of evaporation produced, therefore, it should be an object to the manufacturer of sugar, to ascertain what construction of furnaces or flues will ensure the most *rapid* combustion of his fuel.

It is scarcely necessary for me to observe that to take full advantage of rapid evaporation without the aid of vacuum pans, you must purify your liquor as well as you can—since, as I have before named, the more improved the liquor the more susceptible is it of carbonisation; and, of course, the greater the extent of carbonisation, the greater is the deterioration (by its colour) in the value of the Sugar.

No one could conclude his observations on the manufacture of sugar till he had alluded to one most prominent obstacle to his improvement: an obstacle which cannot easily be overcome. Prejudice! Prejudice is as deeply rooted in the heart of the Jamaica Planter, or I would even say *obstinacy* ITSELF is as much part of a Planter's character, as is his well known urbanity, his hospitality, his ever-welcome. Amongst this class, we see that the *young ones* are, perhaps *(wisely enough) timid* of varying the *old*—the ACCUSTOMED routine of the boiling house; whilst the " *old stagers*" are so wedded to the precise process which they have again and again proved to *make* sugar, (quality and quantity no matter, these they say depend on *the cane !*) that every attempt at improvement is discouraged.

Whenever I meet with a planter, I strive to convince him that in his hopes to improve on the present system of sugar making, his greatest foe is *prejudice*: yet, one and all will aver that he is not prejudiced—on the contrary, that he is more open to conviction, than any one else in the world. Still, I feel persuaded that *improvement* is an idea already stamped with a very bad name in Jamaica,—ever looked on with suspicion; therefore, ever having an Argus eye on it, raised not so much to enquire after the merits, as to search out and pry after every objection that, by contingent circumstances, or by the *possibility* even of casual mishaps, may paralyze for the moment the full development of the contemplated improvement, or slightly lessen its general application. I am aware that in these statements I shall be contradicted, although made by me, a perfectly disinterested party; but, in return, I would again and again ask planters, how in the name of common sense, *can* they allow one-tenth part of their hard earned produce to run into the sea? That such is the fact none deny. Do the advocates of such a wasteful manufacture look for a parallel case in some other branch of useful industry? I hope not; for they may look—will look in vain. Of nearly 50,000 hhds. of sugar shipped from this island, during last year, 5,000 hogsheads are, by the manufacturers' permission and request, swamped in the ATLANTIC!

The few suggestions offered in this paper, cannot startle Planters with anything in the shape of novelty; they are founded on a theory that has long since been the theory of chemists, and widely published throughout the colonies, and have already received the laugh and ridicule of every Planter. Still, as long as some intelligent sugar planters do hope for improved processes, no one should flinch from promulgating whatever may give every planter at least a scientific view of the juice on which he is operating: his practice will afford him many opportunities of taking advantage of the peculiar properties of the various ingredients which form the cane juice, and he may himself have the gratification of perfecting and making practicable the crude and untried notions of mere theorists.

SUGAR BOILING.

TO THE EDITOR OF THE JAMAICA STANDARD.

February 28, 1843.

Sir,—I have read with great pleasure Vallance's proposal for Sugar Boiling, with your Editorials thereon, as also Churchill's Essay on the same subject; the latter is very good, indeed I consider it by far the best article that has yet appeared.

I am not a chemist, and therefore in treating of the subject, I labour under a great disadvantage; yet, notwithstanding, I hope to be able to add something to the general fund of information that may prove useful in bringing our labours to a successful result.

Mr. Vallance proposes to "halve the cost and double the amount of produce," in the manufacture; that looks well upon paper certainly, especially when you combine with it, that Mr. O'Keeffe proposes to double the rum crops, of course also at half the expense; whilst I, as my more peculiar province, promise to halve the cost of cultivating the land, and double the produce per acre.—At this rate we shall soon make sugar estates a profitable speculation. I shall not confine my exertions, however, to the Agricultural department, but shall continue to keep the two other branches, as I have long done, under view with the hopes of improving them. I am now ready to back the old process of fermentation and distillation by the rule of thumb, against the fashionable patent (as it is called) process, and expensive instruments." O'Keefe has not yet equalled, with all the facilities offered him, and with all his exertions and experience, what I acccomplished 8 or 10 years ago, as a book-keeper without any assistance or advice. Many other book-keepers have also much excelled by the old method his new process. The misfortune was, that they did not know the reason why they succeeded, and therefore could not, under other circumstances, succeed as well. I have, however, I hope, now found out the reasons of the success and failure by the whole process; and I hereby challenge Mr. O'Keefe to a fair trial of the two methods. If I succeed, I shall publish my plan for the benefit of the Island, and show how success may be insured under the different arrangements of the still-houses. The arriving at the truth, has been a tedious and troublesome investigation, but I feel quite confident of success. I before stated that O'Keefe's first process (the patent) was wrong in principles; I believe he does not now act at all on that plan; we shall see, if he accept the challenge, how far he has improved himself by his upwards of twelve months' study of the subject with constant and extensive practice. It may be very pleasant to know the use of the instruments, but they are of no real benefit without a perfect knowledge of the art of distillation; they show you that you are not getting the returns you ought to get, and which you know without them; but they do not show where you are wrong or how to rectify the matter. There is only one point in which I believe Mr. O'Keefe and I agree, that is, that every estate should make two puncheons for three hogsheads, without manufacturing any cane-juice into rum; if by furnishing the estates with instruments, and the overseers with the requisite instructions, he has enabled them to make two-thirds of rum, then I shall be satisfied to allow my plan to remain in obscurity. I have made two-thirds in practice, but I have not yet heard that he has succeeded; but, perhaps, some of my St. Thomas in the East friends may inform me on this point of the greatest success that has crowned his efforts in their district. How is it that O'Keefe's champion, "Perfer et Obdura," never took the trouble to answer my former challenge, and to prove the success of what I termed a failure? He put himself forward as the champion, and said if people contradicted O'Keefe's success, he would prove to the contrary. I flatly contradicted his assertions, and he has never yet produced his proof. This is rather singular in a case of such easy proof! In St. Thos. in the East, on one occasion, I made 83½ puncheons to 134 hogsheads; on another, 31 puncheons to 44 hogsheads; and latterly here, 18 puncheons to 26 hogsheads; and each time without any canejuice.

Before returning to Vallance's plan, I wish to suggest a trial of an apparatus for blowing air through the boiling liquor in the teache by means of a fanning machine, on a construction similar to the fans used, instead of bellows for creating draught in the large furnaces at home. This, in addition to Mr. Noyes' method of hanging coppers, will make the evaporating apparatus perfect, in my opinion. It is a plan most highly recommended by Porter on the Sugar cane, who states that by means of it the operation is very much hastened, and the temperature kept nearly as low as by the celebrated vacuum pan of Mr. Howard. It has been successfully tried, on a small scale, in this country, and I expected to have had one on a small scale at work before now, but have been disappointed by the party agreeing to make the machine. I am so confident of the benefit that I shall try it the first opportunity, but as the thing is simple, and not expensive, others may be induced to try it in the mean time, and publish the result.

But to return to Mr. Vallance's plan. I cannot pretend to say how he proposes to effect the operation, but I think it likely it could be done by creating a vacuum with an air pump, and then allowing the admission of air under the surface of the liquor, which would cause a movement similar to ebullition, and the watery parts would be drawn off in the shape of steam with the air by the pump, and without the application of any heat.

Mr. Vallance starts on the common and fallacious theory that cane-juice is essentially sugar and water, and that molasses is only formed by the charring of the Sugar from the excessive heat. He also much over-estimates the usual quantity of molasses : he states "that for every hundred weight of the saccharum of the cane which is chrystallized into sugar, a hundred weight and a third of that saccharum is burnt into molasses; so that the quantity of sugar now obtained from any given number of canes can be one-third more than doubled." Now against this I place the results of my experience. When a bookkeeper, I kept an accurate account for my own information, of the cane-juice ground at the mill, the quantity of skimmings, and also of molasses I received, to the number of hogsheads made. Of course I could then have no theory in view, and I simply registered facts. The estate was by no means a good yielding one, and therefore it is rather in favor of Vallance's theory than otherwise. 698,000 gallons were boiled to make 295 hhds. or 2360 gallons (old measure) per hhd. of 18 cwt. Porter reckons a wine gallon of juice to make a pound of sugar on an average, and it is about right: I shall however reckon 2,000 imperial gallons to make 2,000 pounds of sugar or 18 cwt. which is a little more than stated above. Now the skimmings, Porter says, average 7 per cent of the cane-juice; mine averaged from 8 to 9 per cent, including the water used for washing the pan ; 7 per cent therefore is very fair. Now 7 per cent on 2,000 gallons is 140, and the 140 gallons of skimmings are equal to about 24 of molasses :— Porter calculating 6 of skimmings equal to one of molasses, but bookkeepers usually reckon ten for one. Then my supply of molasses was 85 gallons old measure, or 70 imperial, including a good deal of sugar that always runs out of the hogsheads into the molasses cistern, and which ought to be recovered. Porter reckons 60 gals. molasses for 16 cwt. which is at the rate of 56 imperial per 18 cwt.—so that my calculations are very favorable to Mr. Vallance. The molasses and skimmings together are therefore equal to 94 gals. of molasses, and supposing the molasses to be of the richest description, which it certainly was not in my case, and to weigh 15 pounds a gallon, the whole weight, if every particle were converted into sugar, would only be 1200lbs. instead of 2500, as calculated by him : a very wide difference certainly. But how is it possible to suppose that all the skimmings and molasses can by any process be converted into sugar? From what I wrote previously on the nature of sap when arguing on the filter, and also from Mr. Churchill's description of the vegetable components of cane juice; it is impossible to suppose that anything like the 1200 pounds can be converted into sugar. If you cut the cane at the very ripest period of its growth, and in the driest weather, there must be a certain quantity of sap containing vegetable albumen, gluten, gum, colouring matter, &c. which are certainly not capable of forming sugar by any process. If Mr. Vallance's plan succeeded, he may probably save half the quantity I have calculated, or 5 or 600lbs. of saccharum from being converted into molasses, If this amount can be saved, it would be a great object, as the price of rum, from the increase of the Temperance Societies, is still likely to fall. But with coppers hung on Noyes' plan, the quantity of skimmings and molasses equal to what I have allowed above would not be obtained; and if the blowing apparatus succeed the quantity of saccharum converted into molasses will be still further reduced. By a better mode of tempering the liquor also, which I will mention presently, the same object may be partially gained, as also to a certain extent, by a different process of potting the sugar; in both of which operations a loss of sugar usually occurs. Therefore the gain to be obtained from the introduction of Mr. Vallance's plan must be much further reduced. His plan, if successful, will no doubt, improve the colour to the extent he estimates, of a penny a pound. If he succeed in evaporating at the rate of 4 or 500 gallons an hour, instead of 1000 it will be quite sufficient for this colony.

I think I have shown that Mr. Vallance cannot double the produce, or even approximate to that result, and therefore he cannot halve the cost. As to the trash being saved for manure, the Planters would not know what to do with it; they have only cattle and carts enough to carry canes to the mill, without having to cart the trash away again for dung, and which instead of proving an inducement would form an obstacle to the adoption of the plan.

Now for Mr. Churchill's essay; he says the vegetable albumen, &c. in the cane-juice only form one two hundred and fiftieth part; I have shown above that the skimmings, which is the part in question, form 7 per cent of the juice, without reckoning molasses. This is all the fault I have to find with him, except that he does not explain the necessity for the use of lime in sugar boiling. We planters use it, as a matter of course, but I have never met with any body that can give me a good explanation of the use of it, and I hope Mr. C. will, therefore, rectify his omission. Is the use of it for clarifying the liquor and separating the impurities? or for neutralizing any acid that may form? or for causing the sugar to granulate? The favour of an answer to these questions will particularly oblige. My mode of tempering, which I consider very superior to the common plan, and which was introduced from the Windward Islands, is by using a saccharate of lime, that is lime mixed with syrup, and allowed to settle till it becomes a clear brandy colour. I usually mix a gallon of half boiled syrup to a pound of temper. The clear liquor is then added instead of raw temper in the clarifier, but always in less quantity than is known to be requisite for boiling the sugar, a further addition being made in the teache until the liquor on boiling down to syrup, cuts freely as the people say, or, more properly speaking, breaks off in short drops from the edge of a skimmer after having been immersed and then cooled a little by being twirled round. I think a still preferable mode would be to separate the impurities and albuminous matter in the clarifier by heat alone, and not to add any temper till the liquor is drawn down into the grand copper. Will Mr. Churchill also have the goodness to explain how the saccharate of lime acts, and whether my last proposition is likely to prove beneficial.

Lockhart's coppers are said to lose trash, and Noyes' to gain trash, in making fire: we planters usually find that when we have a good fire we gain, but with a bad fire lose, trash; which appears correct in theory, and coincides with Doctor Ure's practice; but how much more would they gain fuel if the process were hastened as I recommended above; the trash would then be sufficient for both boiling house and still-house.

I can only take a short notice of C's address to me on his proposed plan for growing canes, and erecting manufactories; he must certainly be making fun of the matter. If he grew canes five miles away from my estate, I would not cart them to my manufactory, if he made me a present of them. No wonder planters told him his scheme was visionary: it is quite impracticable, and it is therefore useless discussing its merits or demerits; but if he is not satisfied with this answer, let him calculate the cost of carting the canes to the mill, and try his scheme by the test of figures.

AGRICOLA.

JAMAICA AGRICULTURE.

TO THE EDITOR OF THE JAMAICA STANDARD.

March 8, 1843.

In copying my last communication on Sugar Boiling, your Compositors made some misprints.

With reference to the cane cutting machine, you propose, I expressed my opinion on the subject, when Mr. Whitty proposed the same thing,—I said it was impracticable, and I still adhere to the same opinion. It may succeed in the United States, because they grow the cane under totally different circumstances to what we do. The cold weather destroys the cane with them in the winter, they have therefore to plant the field anew every year, and the cane must be cut at nine or ten months old, before the cold weather sets in again; the cane therefore stands upright, and can be mowed down the same as corn, if the machinery be powerful enough; we, however, leave the cane till fourteen or fifteen months old, at which time it is most ripe and fit for cutting, and by which time also it has leaned down on all sides in regular irregularity, and could not be mowed by any machine. Again, the machine cannot cut the canes quite close to the ground, so that, if they were able to cultivate the ratoons, they would have to employ people, subsequently to mowing, to cut down the canestumps level with the ground, which would take away the saving of labour effected by the machine.

AGRICOLA.

SUGAR MANUFACTURE.

TO THE EDITOR OF THE JAMAICA STANDARD.

Kingston, March 7, 1843.

Sir,—I consider it my duty to reply to a portion of the letter of "Agricola," published in your number of Saturday last.

I stated, as Agricola correctly quotes, that the extraneous matter contained in cane juice, amounts to only one part in every two hundred and fifty parts of the cane juice, i. e., 4-10 per cent. Agricola's words are—"he says the vegetable albumen, &c., in the cane juice, only form one two hundred and fiftieth part; I have shewn above that the *skimmings, which is the part in question*, form 7 per cent of the juice, without reckoning molasses." Agricola, I am sure, will pardon my saying that he is completely begging the question. The *skimmings* was not the part I was speaking of, but the *fecula*, &c. Agricola does not throw his skimmings into the nearest gully, or on to his cane pieces, as he wisely would do if he believed they consisted merely of the *extraneous* matter; but he transmits them to his *still-house!* and *there* reckons every eight or nine gallons of it as rich in saccharine matter as one gallon of *good* molasses! and I have no doubt he reckons rightly—for his seven per cent of skimmings contains much saccharine matter in addition to my 4-10 per cent of actually extraneous matter. Hence, if, as extraneous matters, one be speaking of the skimmings, and the other of Albumen, Gluten, and Fecula, it must be evident that we are speaking of two very different things. I do not think *Agricola* will doubt this on one moment's reflection: if he do, let me ask what result he would expect from fermenting the juice of ———, say Calalu, (which contains in all probability albumen and gluten—but *no Sugar*)? He will at once answer "merely the usual produce of putrefactive fermentation." But if Agricola will carefully ferment a gallon of *skimmings* (of course after a proper dilution with water,) and distil it, and then calculate, from the weight of the spirit produced, the exact quantity of sugar that *must* have been present to have afforded by its decomposition that spirit, and deduct this weight from the skimmings used, he will find, that the residue will nearly approximate to my 4-10 per cent; for that residue consists of the extraneous matter to which I alluded, together, of course, with the weight of water contained in the skimmings.

The analysis of cane-juice is not difficult, and when I have leisure (perhaps in two or three months time) I shall be happy to furnish Agricola with the exact per centage of the albumen, &c., it contains. I beg to express my thanks to Agricola for calling my attention to the subject of the use of *lime* in sugar-making. The subject, I perceive, is of importance: and I cannot account for my quite losing sight of it, when hastily drawing up the paper I read before the Jamaica Society. I shall certainly take the earliest opportunity my engagements will admit of, to look into the matter; and shall then communicate the result to the Jamaica Society as an appendix to my former Essay.

I am, Sir, Your Obedient Servant,

S. E. CHURCHILL.

DISTILLATION.

TO THE EDITOR OF THE JAMAICA STANDARD.

March 15, 1843.

I am happy to inform you, that Mr. O'Keefe, has taken up my challenge. The trial is to be, who can make the largest proportion of rum to the sugar made in three months on two large estates; he having the superintendance of, or managing personally, one still house, and I having the superintendance of the other; he is to use some kind of ferment and the instruments, and I am to follow the old plan without yeast or instruments.

Mr. Churchill is partly right about the skimmings, although I think he underrates the extraneous matters. When the skimmings are clarified before being used in the still-house, fully two thirds of the quantity is clear cane-juice, and might be boiled into sugar.

AGRICOLA.

DISTILLATION.

TO THE EDITOR OF THE JAMAICA STANDARD.

April 18, 1843.

WHAT are you gentlemen about, conductors of the press, that mighty engine of weal or woe! guardians of the public interests! Are you slumbering at your posts, so that you know not what is going on in the country? Are you so apathetic that you care not for the interests of the public? Are you under the influence of the mesmeric power, that you cannot act? Or, are you silent from baser motives, that you protect us not, and maintain an imperturbable silence on matters affecting our interests? Ignorance you cannot plead—situated at the centre of attraction, at the very market place of the island, where every body and everything are known—and yet you communicate not the information you obtain.

Eighteen months ago, or thereabouts, a gentleman appeared before the public, proposing to effect improvements on one of the three staple productions of the island, and yet who, from reading your columns, would know whether the scheme had been attended with benefit or injury? Will you allow one-third of the produce of the island to be doubled, or be halved, to be made a foot ball of, and never raise your voices either in commendation or disapprobation of the scheme, and never inform others of the result, to be a warning or an inducement? Shame gentlemen! *Planters'* Despatch, send *despatches* to the Planters, and chronicle the information you possess for their benefit! Journal, *Watchman* now no longer, *watch* our interests, and sleep not at your post! STANDARD does rumour with her thousand tongues never reach thy ears? unfurl the flag of protection, weigh, deliberate, and measure our interests with *Standard* measure, then fearlessly *Gazette* the results! let it not be said thou art deficient in moral courage, in energy, or in ability.

The gentleman I have alluded to, (that nothing I say may be considered as alluding to him in his private capacity, but only in his official capacity,) I will call Doctor O.; he will readily be recognised as the party who was to increase enormously the Rum crop. Eighteen months have now elapsed, and it cannot, therefore, be said, that the consideration of his process is prejudging it.

It is a singular parallel in history, that the two great countries of Great Britain and Jamaica should each about the same time stand in need of a physician, and that fortunately in each the Doctor should arise during the crisis to raise the two countries out of their difficulties. Doctor Sir Robert cries out in Great Britain, John Bull is sick and needs a State physician, and I am the man to cure him; call me in and I will prescribe, only my *fee* first, if you please. Doctor O., a worthy imitator of Doctor R.; re-echoes the cry,—I am the Estate's physician, call me in and I will fill the proprietors' pockets with money, only a *fee* first, if you please. Doctor Peel recommended bleeding, copious bleeding, even to the extent of an Income tax, some say wisely, others not so; Doctor O. also, thinks there is nothing like bleeding, and his first prescription is in every case bleeding. Now, it seems that the patients in both cases, in their distress, and in their joy at the prospect of escape, forgot to make the bargain of "no cure no pay," and therefore after paying their fee and bleeding freely, find themselves worse than before. It is to prevent such thoughtlessness for the future, tha induced the writer to pen these remarks.

Doctor O. having been now so long in practice, having according to his own account had about three hundred Sugar estates under his charge, with fees varying from £20 to £60, and therefore made a comfortable purse of £10,000; we may surely be allowed, without having improper motives attributed, to see if the country has benefited to a similar amount. As far as I can learn, I say no, decidedly not; it is for you, gentlemen of the press, to ascertain how the truth lies. Some six months ago, the *Standard* hinted that the success of the plan was doubtful; can you say, gentlemen, that since then you have never received positive information of the result? I have not met with one individual, who, after any length of trial, did not consider it a failure.

In Clarendon, the process of distillation introduced by Doctor O, is, rumour says, totally given up; is this a proof of success?—In Saint Andrew's, I have not heard the result, but you ought to know. In Saint Thomas in the East, I am assured by several parties of the highest respectability, that there is not one estate following the plan, but that the whole of the estates that tried it fell off largely in the returns. It must be remembered that Doctor O. made St. Thomas in the East his residence for months, that he had the finest estates under his charge with unlimited means, and yet the result is as I have stated. To enter more into particulars, one estate, Winchester, I have it from the best authority, paid the Doctor to give up his bargain. Another, Holland, after losing a large quantity of rum, refused to pay him the balance due for his *services*. At Amity Hall and Hordley, one or both, he did nothing for his money, as he found he was looked after more than was agreeable. To these I may add, Plantain Garden River, Harbour Head, & Retreat Estates, as estates where I knew the process to have been unsuccessful. One gentleman informed me that the returns from the liquor set by the Doctor, after continuing the process for some time, fell off to nothing, as he said (and very properly) that he used sour leaven to excite fermentation, and that the sourness produced sourness until every thing became so sour that maggots were generated in the liquor, and that the people actually would not drink the rum. A party also wrote out from home that the rum was nearly unsaleable. The consequence of all these results was that, one and all, they scrubbed and scoured, and washed, till they got every thing sweet again, and then resumed their old system.

Such being the case, I remarked that they were very negligent in their duty to their neighbours, by allowing us to be placed in a similar predicament; they said they were so ashamed that nobody liked to come forward; and some even seemed to enjoy the thoughts that they were likely to have partners in their afflictions,—thus verifying the old fable of the fox that lost his tail in a way not very honorable or gratifying to his vanity, and who endeavoured to induce others to adopt his new fashion, which he ventured to suggest was a great improvement.

But the Doctor does not confine his assistance to the use of his patent process of fermentation; he also undertakes to instruct in the use of the Instruments—now it will readily suggest itself to the mind of an intelligent reader that the Doctor having failed to instruct himself in the use of the instruments so as to apply them beneficially, is really not a competent person to instruct others in the use of them. For my part, in ninety-nine cases out of a hundred, I consider them perfectly useless, and as soon as the novelty wears off, they will all be laid aside. They have been of use to me in elucidating the science of distillation, but for practical purposes, I shall never use them.

Such being the state of affairs, how is it that the Press maintains an obstinate silence? We, planters, can only attribute it to your not caring for our interests.

I know I shall be found fault with for this publication. Several mutual friends of the Doctor and of me, have already argued with me, if argument it can be called, that I was likely to injure him without benefiting myself; my answer is, if the improvement is no improvement, much more so if it is an injury, why should all this money change hands; if it is benefiting one party, it is injuring another party to an equivalent amount. It is very disagreeable for any individual to have to find fault publicly with another, but it is a duty due to the public to do so, in a matter of such importance as this; but in a country like this, where the constitution of society is such that all parties are known to each other, these matters ought to be discussed by a disinterested party, the Press.

It is more necessary to notice this matter, as whilst the first scene is enacting, a second scene is in course of preparation, namely the improving the process of sugar boiling. Every body knows that blood is largely used in refining sugar at home, what, then, such a likely remedy as bleeding, copious bleeding again! Planters, whilst giving every facility in your power, take advice, and let your motto be, "no cure no pay," and give no certificates of success until after having given the matter a fair and a *long* trial; bind yourselves to no payment till the benefit is really ascertained.

AGRICOLA.

DISTILLATION.

TO THE EX-EDITOR OF THE JAMAICA STANDARD.

July 12, 1843.

SIR,—Excuse my addressing you under the above title, as I did not know what other to give you at present. Misfortunes we are all liable to; you have now got your share; I trust, however, they will not be of long duration.

On behalf of a large portion of the Agricultural interests, I beg to assure you of the admiration in which you are held, for the zeal and talent you have displayed in supporting our interests on all occasions. This feeling will, I am persuaded, induce many besides myself to give you their willing support, whenever the new paper may appear, which I hope will be shortly.

As you have taken a warm interest in the O'Keeffe affair, I need scarcely remind you that about four months ago, upon O'Keeffe coming into my district, I challenged him to a trial of skill, at the same time warning the planters that his improvements had turned out to be a failure, and that at any rate, if determined to try his skill, to take the prudent precaution of not paying him any money in advance. This, as might be expected, put him in a thundering rage, he and his satellites abused me in terms not very polite; however, there was no way of escaping the challenge, without palpably convicting himself of imposition.

With a very bad grace indeed he accepted my terms, which were, that I should pursue the old system of distillation for three months on one estate, and that he should put in force his patent system for three months on another estate, the attorney informing us that the average proportion of rum to sugar on the two estates was usually similar, and kindly promising that we should each have fair play.

I have now the gratification of informing you that the result is in favour of the old system.—Mr. O'Keeffe, although with constant and most extensive practice for two years, cannot make even a tolerable rum crop, much less instruct other people how to increase theirs.

The public would be surprised at his sly departure from the Island; the above information will furnish them with a satisfactory reason for the proceeding.

He acknowledged, when accepting the challenge, that if he lost, his hopes would be ruined; and it was the consciousness that he would lose, that made him so bitter against me, although I think nothing could be more reasonable than to ask him to give a public demonstration, as he was pocketing such large sums of money, that he really could increase the returns. Accordingly as soon as he finds that the game is up, and that he has no further chance, off he goes without either giving me a parting salute, or bidding those kind friends good-bye, whose cash he has so coolly transferred to his own pocket. Very unkind treatment, very.

I must congratulate those gentlemen living in the leeward parishes who have not yet been honoured with the Doctor's presence, upon being £50 a piece richer than if he had visited them. I assure them Dr. O. is the most brazen-faced man possible, and possessed of such a mesmeric power that he, in nine cases out of ten, forces the attorney or proprietor to hand out £50, and the Overseer to give him a certificate of success, before he does a thing.

What a last long melancholy look he must have cast to the Westward, when leaving the harbour; perhaps he consoled himself with the idea that the grapes were sour! With very different eyes would he view the estates along the windward coast, as he steamed along.

I would scarcely indulge in these remarks, although I have some right to exult in my success after the shameful way in which he abused me; I say, I would scarcely indulge in these remarks, as I really do not bear him the smallest ill-will, if it were not for the chance that he may be wending his way to some of our fellow colonists to give them a *benefit*, and if so, the sooner this letter wends its way to the same quarter, the better.

In giving the challenge, it was my intention, if successful, to publish my ideas on distillation; for, mark me, I did not say that I had found out any new system; all that I said was, that every body knew that very large returns were got by the old plan, but that for some cause or other people could not make sure of obtaining them, and that I thought I had found out the cause why. I propose now to give the result of my experience for the benefit of the public, and let them judge for themselves; if beneficial, they have nothing to pay, and if it should be the means of enabling parties, whose crops have been O'Keeffized to make up the losses sustained, then will my victory be complete, and I shall be satisfied.

I shall give my instructions without the use of the instruments; these, before 12 months, will all be laid aside; people may amuse themselves for a time with them, but they will find that they do not get one wine glass full of rum more than they would have done if they had not used them.

I beg to return my sincere thanks to those parties who voluntarily came forward to support my humble efforts in the public cause, and to encourage me with their approbation, at a time when my opponent was straining every nerve to crush me under his powerful influence.

The still-house under my superintendance, made one and-a-half puncheons over the half during the three months' trial, although I had to alter several of the arrangements of the still-house at first, and which it took, from unavoidable causes, nearly a month to complete; although the alterations themselves did not come to the value of £5. There were also some other causes that operated against me, but which it is unnecessary to specify. All the canes cut during the period too, were rattoons, which reduces the quantity of molasses.

The still-house, under the charge of Mr. O'Keeffe has made

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Having waited until the departure of the Post in the hopes of being able to forward an official return, I must apologise for leaving the last paragraph blank, but hope to be able next post to supply the deficiency.

AGRICOLA.

Postscript, July 19, 1843.

In my last, I was obliged to leave you in suspense, as to the result of O'Keeffe's process of distillation.

In answer to my repeated applications for information, I have now the pleasure of informing you that the gentleman in charge of the property has determined that "it would be unfair to give me any information concerning Mr. O'Keeffe's success (qy. failure) in the still-house in his absence, but, that as soon as he returns, every information will be given." This is tantamount to saying that it is so exceedingly bad, that they are ashamed to confess it; and therefore it is needless for me to say anything further on the subject. *When* Mr. O'Keeffe comes back, he will, no doubt, of his own accord, publicly acknowledge his failure.

AGRICOLA.

DISTILLATION.—No. 2.

TO THE EDITOR OF THE JAMAICA TIMES:

ARRANGEMENT OF THE HOUSE.

SIR,—Strange as it may appear, the great thing in Distillation is the arrangement of the vessels. Under certain arrangements a good crop is almost sure, and under others a bad crop is almost as certain, even after all the exertion that can be used on the part of the bookkeeper; and this arises from the difficulty of tracing the effect to the cause, as in Distillation there are so many things to be considered, that ten to one, the effect is attributed to the wrong cause.

It is well known that a bookkeeper may make a capital crop on one estate and yet upon removal to another, do what he can, and follow out the same system as much as he is able, he cannot insure the same result. How is this? Some difference occurs in the arrangement, and he thinking, with most people, that every thing depends on the setting of the liquor, is deceived in his expectations.

The first essential is to have a mixing cistern capable of holding a vat and-half of liquor. The mixing cistern is the substitute we employ for yeast; it acts in the same way.—When a vat of liquor is pumped up, half a vat remaining in a state of strong fermentation impregnates immediately the fresh mixture placed in it, thus insuring a rapid fermentation: this is essential to a good return; as by a slow process the acetous fermentation goes on simultaneously with the vinous one.

The arrangement of the skimming cistern should be such that the skimmings can be drawn down perfectly clarified every morning, and the cistern be washed out before work recommences in the boiling house; there should be no pump employed for the skimmings as it will always be sour. There should be a dunder cooler, as the dunder employed should always be cold and clarified.

The distilling apparatus cannot be altered, but sometimes the method of employing it may be beneficially varied. I consider the still and two retorts the best adapted to our use, and the arrangement generally insures a good return. When only one retort is employed, a very wide difference in the returns may be effected by a very trifling difference in the practice of using it: it is one which would not occur to most people, and was, I must confess, a most complete difficulty to myself for years; and as it will exemplify my argument, I will briefly relate what occurred to myself.

The Estates I lived on as a Bookkeeper, and where I made good crops, had two retorts, consequently the liquor was put in the still, the weak low-wines into the first retort, and the strong wines into the second retort, and the returns were good. When an Overseer on a different Estate, the rum crop not being good, I took special charge of the still house, and of course expected by following the same plans as when a bookkeeper to obtain the same returns; I thought at that time, that all depended on the setting of the liquor, and that if the liquor was good, it was no matter by what apparatus distilled, the returns ought to be good also. But no such thing—I could not get good returns: the only difference in the circumstances was that instead of having two, I had only one retort. I argued, however, that that could make no difference; that the liquor to be distilled, whether as liquor or weak low wines or strong wines, was essentially rum and water, and therefore it was no matter how it was distilled. This seems a rational enough argument, and I dare say has occurred to many besides me; it is, however, wrong. Well, I could not get good returns; in fact the more I tried the worse they seemed to get. I argued the point with many of my acquaintances to ascertain the cause of it: two experienced old planters told me, that instead of putting the weak low-wines every day into the still along with the liquor, (for want of having a weak low wine retort) I ought to keep them till the end of the week, and run a low-wine still. It appeared a very absurd remedy, but it turned out to be correct. I argued with them that whether the spirit and water were distilled in five days, or whether part was kept back and distilled by itself on the sixth day, could make no real difference in the product. They still insisted that it did make such a difference; they said they could not explain the reason why; but that they had found from experience that such was the case, and in support of their opinions they said that every estate that mixed the low-wines day by day with the liquor did not make a rum crop equal to the half of the sugar crop, and that, on the other hand, every estate that kept the weak low-wines till the end of the week and distilled them separately, made more than the half of rum; in fact, that all the rum obtained from the low-wine still was a clear increase. I said I could not conceive how such could be the case; but that the facts they stated were very strong and required investigation.

I argued the point with many planters, and I considered the subject maturely, but without arriving at the truth; at last I fell in with an intelligent planter (Mr. Espeut) who suggested to me, and for which I think he deserves great credit, the manner in which it occurred, and which immediately carried conviction to my mind. He said he conceived it was because the weak low wines always became slightly acid, and that by putting them into the still with the liquor, although it could not prejudice the present return, it acted injuriously on the future fermentation by the addition of acid matter to dunder.

Now with two retorts the possibility of this injury arising is prevented simply by the different arrangement, and it fully explains how necessary it is to ensure success, that where only one retort is employed the bookkeeper should keep the weak low wines separate from the liquor.

While on this subject it will be well to mention, that the practice adopted by many bookkeepers, of throwing the last two or three cans of low wines, got from the still into the vat of liquor to be run the next day, instead of into the low wine cask, is equally injurious; there is always more or less acid in the weak low wines, and the addition of it to the liquor will increase the acidity of the dunder, and re-act on future rounds.

AGRICOLA.

DISTILLATION.—No. 3.

TO THE EDITOR OF THE JAMAICA TIMES.

ON THE USE OF THE DUNDER.

The use of Dunder or Lees has always been a puzzler to parties studying the process of fermentation in this country, on comparing it with the system adopted at home. It has always been considered as a useless, if not an injurious ingredient, in the fermenting mixture; the planters have, however, in spite of all opposition adhered steadily to the use of it, and experience, I think, fully proves the correctness of the practice.

Porter, in his work on the Sugar Cane, when treating of Distillation, mentions the general use of Dunder, but thinks it unnecessary, and that the only plea for its use, is, that a part of the sweets of the previous fermentation may sometimes remain in it from the previous process not being properly performed, and that thus, by using the Dundor, the sweets may be returned for re-fermentation and waste be prevented. This is no doubt sometimes the case, but it will not explain the use of it under other circumstances.

Dubrunfaut, in his work on Distillation, recommends the use of the Lees on much the same grounds, and on account of economy, by using them warm to prevent the necessity of boiling water for the purpose of heating the fermenting mixture, a very poor reason certainly, and showing that the real nature is not understood.

I have not been able to find a satisfactory explanation of the use of Dunder in any of the works on the subject of tropical Distillation.

O'Keeffe started like many others on the English plan, throwing the Dunder overboard as useless; finding, however, his plan a signal failure, he was obliged to return to the use of it, and then endeavoured to account for it, as the addition of an acid, (see the specification of his patent process,) to neutralise the excess of lime, used in Sugar boiling. Taking a leaf out of Dubrunfaut's French process of fermenting the Molasses from Beet-root Sugar, where the addition of a small quantity of acid is found beneficial, he immediately jumped to the conclusion that such was the use of Dunder, and gave instructions that a certain quantity of cold acid Dunder should be added. Unfortunately for his theory, Dunder happens not to be an acid where the process is properly performed, as I have frequently tested it with limestone and found no effervescence occur.

Then, what is the use of Dunder? In answering this question I must acknowledge that I do it with some diffidence, knowing that it will be severely criticised by parties conversant with chemistry. I am unfortunately not much versed in chemistry, and must therefore state its use in the light in which it appears to me, and shall be glad if any body will give a better elucidation of the subject. I think it has a three-fold use.

Its chief use I consider to be in increasing the gravity of the liquor without adding sweet, thereby making the process of fermentation more slow and cool. Liquor set without Dunder works so rapidly that the heat rises to such a point as to cause the spirit as fast as formed to evaporate with the carbonic acid. Liquor set with a sufficient quantity of Dunder works much slower, and ten or fifteen degrees of temperature cooler, and therefore the evaporation of alcohol is avoided.

The second use, which was suggested to me by an intelligent friend of mine, the same gentleman I mentioned before, and which I think very probable, is that its use is similar to that of hops in beer; preventing by the bitter principle contained in it the acidification of the sweets employed, and which I think it may be a powerful agent in doing, as the high temperature of the climate and the still higher temperature caused by the natural heating of the fermenting liquor, have a great tendency to cause acidification. Dubrunfaut states that a temperature of from 95 to 100 will cause the fermentation of acid. Liebig states that the less sweet the vegetable juice is, the more liable it is to acidify, and that the juice of Beet-roots fermented at 86 to 95 yields no Alcohol, but a substance called mannite and lactic acid. It seems highly probable therefore that Dunder is useful from the bitter principle contained in it in preventing acidity.

The third use of Dunder I conceive to be from its accumulating the superfluous yeasty matter or gluten from previous fermentations where there may have been an excess of it employed; and being there ready to be called into play at any time, when from want of skimmings or other causes, there may be a deficiency. Boiling destroys for a time the active power of yeast, but it resumes its power on cooling. Dunder certainly possesses the power of causing fermentation; for on some estates it constantly, and on others occasionally, enters into fermentation spontaneously on cooling. This is owing to the liquor having been set too sweet, and a part of the sweet remaining undecomposed, which is always the case where liquor is set too sweet. The gluten accumulated in the Dunder on the cooling of that liquid causes the previously undecomposed sweet to go through the natural process of fermentation. Some book-keepers have a most extraordinary dread of this fermenting dunder, which they call *live* Dunder, and say that if used, the liquor will never cease working: it is a complete bugbear to them, and they insist on its being immediately thrown away. It will be seen from the above explanation that it is a perfectly harmless substance, and all that the book-keeper has to do to prevent it, is to set the liquor less sweet for the future. As a book-keeper, my Dunder used constantly to ferment; at that time I did not know the cause of it, but I never found any injurious results from the use of it as my acquaintances predicted. To show the advantage of knowing even a trifle like this, I may mention for the use of the youngsters now learning the art, that at the end of crop, I filled my vats all half full of Dunder, as usual to keep them water tight, and upon inspecting them, I found they all worked away as if filled with fresh liquor. Oh! said I, "that's all live dunder, I must throw it away, and I shall have no good Dunder to begin next crop with." If I had had the knowledge that it was simply a quantity of sweets undecomposed in the previous fermentation, I should have immediately determined to distil it as soon as it ceased working, and I should have accordingly increased the crop two or three puncheons of rum; on the contrary, for the want of that knowledge, I allowed it to remain unnoticed and uncared for.

On repeating this circumstance to a friend of mine, he told me of a case in point that occurred to himself. When a bookkeeper, he was ordered to complete a shipment of rum, and not having liquor ready for running, he distilled several vats before the process of fermentation was complete: he found the Dunder from them worked spontaneously; he pumped it back into the vats; allowed it to work again, distilled it; and got a good return from it.

In distilling all the spirit should be extracted that is possible. Many bookkeepers think it a good plan to leave some spirit in the Dunder to make it strong: if they had said to make it sour, they would have been quite right, the heat of the Dunder after coming out of the still, will cause the spirit left to become almost immediately sour.

AGRICOLA.

DISTILLATION.—No. 4.

TO THE EDITOR OF THE JAMAICA TIMES.

ON THE CHOICE OF WATER.

Dubrunfaut recommends the clearest spring or well water, as being free from all vegetable and animal matters, and if possible, impregnated with carbonate of lime. There is not much choice for us in this respect; we must use the nearest water; but sometimes bookkeepers use the tank water, which is generally in a state of partial putrefaction, when they might get cleaner water *conveniently from the river*. The use of such water injures the return, by causing part of the sweets to undergo the putrefactive fermentation.

ON TEMPERATURE.

The temperature of the fermenting liquid cannot be kept too low. At home, during the height of the operation, they do not allow the temperature to rise above 75, we start at 80 and go up to 95 or upwards.

Dubrunfaut recommends one thousand gallon vats to be set at a temperature of 65, and states that they rise about 10 degrees in heat during the fermentation. He states that at 100 the acetous fermentation acts at the expense of the alcohol; and that besides there is the loss of another quantity of alcohol from evaporation. Liquor set without dunder will frequently work up to 100, besides even at a lower temperature the motion of the liquor is so rapid that the gas in its evolution carries off a considerable portion of alcohol. The addition of a considerable portion of dunder makes, by its gravity, the intestine motion of the liquor slower, and consequently keeps it cooler.

ON THE SWEETS EMPLOYED.

Molasses should not be used in a greater proportion than 10 per cent. The largest proportionate returns I have obtained were from vats set at 8 per cent. of molasses, with the usual allowance of skimmings. The proportion of molasses should certainly not exceed 10 per cent., else a part will remain in the dunder undecomposed.

The skimmings are the first cause of fermentation; if allowed to remain twenty-four hours in the skimming receiver, they will always be found in a state of fermentation. If from any cause there are no skimmings, there is generally a considerable difficulty in exciting fermentation in molasses wash. The skimmings from plant canes ferment much more freely than from rattoons, from containing more natural ferment or gluten in their composition. The skimmings should be drawn down perfectly clarified, as the extraneous vegetable matters favour the destructive or putrefactive fermentation.

When the stillhouse is regularly at work, the liquor always left in the mixing cistern acts as yeast, and sets the fresh mixture working with rapidity, and without delay. About one half of the mixture may be of cold clarified dunder. Under these circumstances, the liquor will take about a week to fall, which I consider to be the most favorable period, as that time will allow the fermentation to be sufficiently slow to prevent evaporation, and yet sufficiently rapid to insure the decomposition of all the sweets, and to prevent the acetous fermentation.

OTHER DIRECTIONS.

The weaker and warmer the liquor is set, the quicker the fermentation will be, and the fermentation may always be made more rapid by the addition of water or warmth.

All the vats should be washed every time they are used, and a quantity of broken limestone, (not quick lime) be kept in each of them, according to a plan long ago recommended by Dr. Higgins in this country, to neutralize acidity as fast as formed; as in the best process some acid will always be formed.

Liquor, when nearly finished fermenting, enters very quickly into the acetous fermentation when exposed to the atmosphere, that is to say, the spirit formed follows the natural course of nature, and begins to change into vinegar. To prevent this change, in filling the vat, a space of six or eight inches should be left, and a thin wooden moveable cover should be kept on the vat, not to keep it warm, or to keep in the spirit, as commonly supposed, but to prevent the stratum of gas on the surface of the liquor from being displaced by the breeze; and consequently preventing the partial acidification of the liquor by the atmosphere; for the carbonic acid gas evolved during the fermentation being heavier than the atmosphere, lies on the surface of the liquor, and prevents the air having access.

In loading the still, the liquor in the vat should not be turned up, as the sediment will then run into the still, settle at the bottom, become burnt, and injure the flavour of the spirit. When as much liquor has run out from the vat, as will run from the cock, the bottoms should be taken out in pails, or through a plug hole, and thrown into a small vessel to settle, and the clear liquor be afterwards thrown in the next still. If the bottoms are left in the vat, they will become sour, and will taint the new liquor pumped up.

In setting liquor, I have found that by running in all the materials at the same time, such a check was given to the fermentation, that after being well mixed up, the liquor became as it were dead; upon the recommencement of the fermentation, a thick scum was thrown up in the same manner as liquor yaws in the clarifier; it should then be skimmed as quickly as possible, by which means a large quantity of dirt is got out of it, and which I could not get by any other process. I have also found that a similar scum was again thrown up on the top of the vat as it was finished pumping, caused in the same way by checking the fermentation; this must be taken off in the course of a minute, as it seldom lasts longer, the rapid fermentation commencing and carrying the particles up and down. By attending to these two periods, I used to get my liquor beautifully clear.

Regularity is a great thing in distilling. Set a vat of liquor every day, if possible, and always in the same manner, and then, day by day, there will always be a vat ready for distillation; the regularity will cause an economical application of labour, and will save the bookkeeper a great deal of unnecessary annoyance.

AGRICOLA.

PRIZE ESSAY,

ON THE CULTIVATION OF THE SUGAR CANE.

"A bright ploughshare is the cheapest commodity ever used by a Farmer."—COBBETT.

INTRODUCTION.

In competing for the Prize offered by his Excellency the Governor for economising labour in the cultivation of the Cane, the greater part of the saving proposed by my plan being immediately connected with, and dependent upon, the adoption of a system of cultivation different from that at present pursued, I have been compelled, at considerable length, to state the arguments upon which the new system of cultivation is founded; as, without satisfactory proof of the correctness of its principles, it is not likely that its practices will be adopted; and, without the system be adopted, a large part of the proposed saving of labour must be lost. It becomes, therefore, a matter of the greatest importance to establish it on a correct basis. I trust, therefore, that, though the subject be new, and the Essay long, it will meet with the attention and deliberation that any plan proposed for benefiting the country deserves.

In the following Essay, I have endeavoured to combine both practice and theory, and I hope I shall be thought no worse of for having now, for the first time, endeavoured to prove, from scientific principles, the truth of the practices adopted,. In every part of the subject I shall endeavour to show, not only that the practice proposed is founded on the truest principles of science, but that, at the same time, it is in accordance with the results of practical experience.

I had arrived at nearly all the results from my own individual practice, previous to the proposal of the Prize, and previous to the falling into my hands of the volume which has laid open to view the innermost recesses of the science of Agriculture, I mean Liebig's admirable work on Organic Chemistry. For me to add my humble testimony in praise of such a work were superfluous; I can only adopt the language of the German Agriculturists on the occasion, "that his work had furnished them with the knowledge they had earnestly sought for all their lives, but which they had long ceased to hope for."

I have confirmed my own views by the practice and opinions of the best Planters among my friends. To study was new to them, but an explanation of the different phenomena brought to their recollection many facts confirmatory of my views, and which, before, they had been unable to explain. As they are all practical men, and successful Planters, I gladly avail myself of their experience in confirmation of my own. I therefore deliver the Essay, confident of the successful results of the practices proposed.

The work to which I have alluded having only been written in the original language in 1840, and been translated in 1841, can scarcely as yet be expected to have fallen into the hands of many parties in this island. I shall therefore quote very largely from it, endeavouring to give a condensed, but connected view of the subject of vegetation. To prove the value of the work, and the estimation in which it is held in England, I beg to preface the extracts with the remarks of the Quarterly Review upon it. This Review verifies the deductions I have drawn from a study of the volume, and therefore has strongly confirmed me in my opinions. I shall merely give the editorial remark, leaving out the extracts quoted, as I afterwards quote more largely, and more particularly on those points peculiarly affecting Cane cultivation. As I quote the work I shall shortly mark those passages which refer more directly to Cane cultivation, that I may not have afterwards, when stating the practical part, to refer to them a second time.

To show the necessity of the course adopted, I need only mention two items in the cultivation of the Cane, which differ essentially in my management from the common practice, and in which two items, I expect to save a large amount of manual labour, namely, *manuring and trashing canes.* These are both expensive operations: Now I propose to do away with them nearly altogether; but how can I ask those parties who are in the habit of practising them, and who, of course, think it necessary to do so—how am I to expect them to change their opinions and their system, without the most satisfactory arguments proving the practices unnecessary?

Viewing the Governor's wish and object, in proposing the Prize, to be, to ascertain the most effectual and beneficial means of cultivating the Cane with the least amount of manual labour, and not confining the Prize to the introduction of Agricultural implements alone, I shall now proceed to my task; again asking not to be condemned, because I propose any thing new or unusual, but to receive a verdict according to the real merits of the case.

Quarterly Review, March, 1842.

Professor Liebig has long enjoyed an European reputation as one of the most profound and sagacious of chemists; and, in particular, has taken the lead, both by his personal labours, and those of the admirable school which he has formed in Germany, in those researches into the chemistry of the animal and vegetable kingdom, which have, within the last fifteen years, created a new science—that of Organic Chemistry.

When Sir Humphry Davy wrote on Agricultural Chemistry, Organic Chemistry was almost unknown. That happy genius did as much as could be done with the materials at his command, and established some principles of the highest importance. The work before us is an attempt to pursue the same path of inductive inquiry, with the aid of the more extended means which the present state of science affords.

Most of our readers are aware that the greater part of all vegetables consists of but four elements—namely, carbon, hydrogen, oxygen, and nitrogen; very often of the first three alone; while the remainder is composed of certain saline earthy and metallic compounds, which form the ashes that remain when vegetables are burned. The former are called the organic, the latter the inorganic elements of plants. Professor Liebig has demonstrated that the latter, although occurring in very small quantity, are yet as essential to the development of the plant as the former; and it is obvious that the first inquiry, in such a work as his, must be as to the sources from which all these necessary constituents are derived, and the best means of supplying them.

With regard to the *carbon* of plants, the general opinion of writers on vegetable physiology, and of practical Agriculturists, attributes its origin to the substance called *humus*, or vegetable mould, which is present in all fertile soils, and which is merely the remains of former vegetables in a state of decay. This substance, either alone or in combination with lime and other alkalies, is believed to be absorbed by the roots, and thus directly to furnish carbon to the plant. But this view has been shown by Mr. Liebig to be quite untenable; and he has demonstrated, by a most ingenious and convincing train of argument, that the carbon of plants is derived from the carbonic acid of the atmosphere. We are tempted to quote pretty largely on this point, both because this section affords an excellent specimen of our author's reasoning, and also because, in the economy of nature, the supply of carbon to plants is beautifully associated with the restoration to the atmosphere of the oxygen removed from it by the respiration of animals and other processes, and thus preserves the air constantly in the same state of fitness for the life of animals.

Passing over an interesting section on the assimilation of *hydrogen,* by plants, we must briefly allude to that on the source of the *nitrogen* in the vegetable kingdom. This element is highly important, as being an essential part of those vegetable products, which serve as food for man and animals. Indeed, Boussingault had proved that the nutritious power of different species of vegetable food is in proportion to the nitrogen they contain.

Without entering into minute details, we may state that Professor Liebig has shown that all the nitrogen of plants and animals is derived from *ammonia;* and that this ammonia is furnished by the *atmosphere,* from which it is brought to the earth in every shower of rain. Its quantity in the atmosphere is relatively very small, but amply sufficient for all the demands of the animal and vegetable kingdom. Indeed, as all the nitrogen of past generations of plants, and animals must, in the process of putrefaction, have been sent into the atmosphere in the form of ammonia, its presence in the air might have been anticipated. It is to Professor Liebeg, however, that we owe the experimental proof of the fact. From the rain-water it is absorbed into the plants; and our author has shown that previous to its undergoing those chemical metamorphoses, which cause its assimilation, it may be detected in the juices of almost all plants.

Although In the case of land not manured, all the ammonia is derived from the atmosphere, it is otherwise in those cases where animal manure is employed. One chief use of animal manure is to yield more ammonia than the air can furnish; and for this purpose, those kinds of manure are obviously the best which contain the largest proportion of ammonia, or of nitrogen. Hence the high value of liquid manure compared with solid, the former being far richer in nitrogen than the latter.

Professor Liebig, after bringing forward numerous proofs that it is ammonia which yields to plants all their nitrogen, then proceeds to explain the principle on which Gypsum, burnt clay, and ferruginous earths act in promoting fertility. All these substances possess the property of absorbing and fixing the ammonia, whether derived from the air or from manure. Many other substances have the same effect; such as powdered charcoal, diluted acids, &c. and some of these will, no doubt, be employed hereafter. It is easy to see why Gypsum, for example, does not equally improve all soils. In some there is already a sufficient quantity either of Gypsum, or some analogous substances, to fix all the ammonia that they receive. If sterile, their sterility must depend on some other cause: for "no conclusion," says the author, "can have a better foundation than this, that it is the ammonia of the atmosphere (where manure is not used) that furnishes nitrogen to plants."

We have already seen that the carbon is furnished by the carbonic acid, while water yields the oxygen and hydrogen. "But another question," says our author, "arises. Are the conditions already considered the only ones necessary to the life of vegetables? It will be shown that they are not." This leads him to the consideration of the *inorganic* or mineral constituents of plants. And here we have another admirable specimen of the manner in which he handles an obscure and difficult subject. He first points out that all plants contain, although in small quantity, certain mineral substances, often different in different plants, but generally the same in the same species. Thus, for example, the stems and leaves of all the gramineæ invariably contain silicate of potash, while phosphate of magnesia and ammonia are found in their seeds. He then shows that those alkaline or earthy bases, which are found in the ashes of plants in the form of carbonates, existed originally in the plants in the form of salts, that is, combined with vegetable acids, which have been destroyed by the combustion. As certain of these vegetable acids are peculiar to certain species, and constantly occur in them, he concludes that they are essential to the development of the species in which they occur; and as they occur in combination with alkaline bases, it is obvious that their bases also are essential to the plants.

We have already said that Professor Liebig deserves the highest praise for his manner of treating this subject, and for the clearness with which he has demonstrated the absolute necessity of the mineral constituents of plants, which have been generally viewed as accidentally present. But he has gone further, and has shown that on this principle are to be explained the good efforts of many practices empirically pursued. Nay, he has proved that cow-dung, the most common animal manure, which, as already mentioned, is very poor in nitrogen, is valuable, not on account of its organic, but its inorganic constituents, namely, potash and phosphates. It is not easy to imagine a more unexpected result, one more satisfactorily demonstrated, or one more capable of immediate practical application.

From the section on the inorganic elements of plants we gather the following highly important conclusions:—First, that since the carbon and nitrogen of plants are derived from the atmosphere, the causes of fertility must be sought for in the mineral or inorganic elements of the soil. Secondly, that since one plant requires different mineral elements from another, a soil may be fertile for one plant, and sterile for another, or *vice versa*; or, finally, fertile for both. Thirdly, that an exact analysis of the ashes of every part of a plant will give us a correct knowledge of those mineral substances which are essential to its development, and which, therefore, must be present in the soil in which we wish to grow the plant. Fourthly, that a careful analysis of any soil, the composition of the ashes of a certain number of plants being previously known, will teach us at once which of these plants may be advantageously cultivated in that soil, which of them cannot be so cultivated, and how the soil may be rendered capable of producing the latter, as well as the former. Lastly, we learn on what the exhaustion of soils depends; on the removal, namely, in the crop, of the mineral elements contained in the plant, for if these be not restored, the soil retains too little for another crop. Hence the use of allowing land to lie fallow; for, during fallow, the action of air and moisture extracts a fresh supply of bases from the subjacent rock, and prepares the soil for a new crop.

Intimately connected with this subject are those of the art of culture, the rotation of crops and manures. We cannot refrain from giving our readers a few illustrations of the results at which Professor Liebig has arrived in regard to the last of these.

In like manner, the author explains that, during life, that portion of the inorganic constituents of the food which is not assimilated by the animal must be found in its excrements.—We have thus two sources of animal manure—the excrements, and the residue left after putrefaction; in other words, the earth of bones.

It is commonly supposed that cow and horse-dung act by virtue of their organic constituents, which, on the one hand in decaying, yield humus, or a corbonaceous residue, and, on the other ammonia. Professor Liebig has shown that, admitting the value of humus (which he has proved elsewhere to consist in its yielding a slow and constant supply of carbonic acid, partly to the air, partly to the roots of plants), the quantity of humus yielded by these manures is quite trifling, compared to the amount of carbon collected in the crop; and we have already seen that horse and cow-dung contain very little nitrogen. But, on analysing these manures, they are found to contain another element, namely, mineral and saline substances.

Bone-manure, the effects of which have excited so much astonishment, acts on the very same principle. Every particle of the bones of cattle, like all other parts of their bodies, has been derived from the grass on which they feed, and consequently from the soil of which the grass grows; and hence, in manuring a field with bone-earth, we are merely restoring what had been removed from it during a much longer period in the form of grass, hay, corn, or turnips. Had the true principle of manures been known, the introduction of bone-earth had not been left for the nineteenth century. Even now, of those who use it, how few have the slightest conception of the reason why it is a manure at all? Eight pounds of bones contain as much phosphate of lime as 1000 lbs. of hay or wheat straw; and two pounds contain as much as 1000 lbs of the grain of wheat or oats: forty pounds of bone-dust, added to an acre of land, is sufficient to supply with phosphates three crops of wheat, clover, potatoes, turnips, &c.

We have great satisfaction in mentioning, as a note to the preceding paragraph, (a "time will come when fields will be manured with the ashes of burnt straw,") that the Professor has been informed, since the publication of his book, that the ashes of straw have long been used in certain districts of Germany as the best manure for wheat. But those who used them had no idea of the cause of their superior excellence as a manure. They acted empirically; and we could not desire a better proof of the great truth, that every discovery, legitimately inferred from observed facts, will, sooner or later, be found to coincide with the best practice, and to explain it—we may add that we have seen letters from German Agriculturists cordially appreciating the principles developed in Liebig's work, as supplying them with that which they had earnestly sought for during their lives, but had long ceased to hope for; having found in the works of Physiologists nothing but contradictory facts, and baseless theories.

With reference to the subject of manures, there are one or two principles which appear to us to flow naturally from Mr. Liebig's researches, and which are worthy of all attention from Agriculturists. The first is, that since every plant extracts from the soil, and retains in its substance only such inorganic matters as are essential to its growth, the very best manure for a plant must be the plant itself, in the form of straw, or even in that of ashes. We have seen how the ashes of wheat straw are, and must be, the best manure for wheat; but the principle must apply universally. Potatoes, for example, will be best manured with the ashes of potatoe-plants, which are singularly rich in phosphate of magnesia, the characteristic salt of the potatoe. Of course, in this case, as in all others, any other ashes containing the same salt, or any source of it, may be employed with equal advantage.

Again, when we reflect on the vast importance of nitrogen as an ingredient of grain, and on the fact, that cow and horse-dung contain very little of that element, we must see how essential it is not to waste any portion of liquid manure, the proper source of that portion of nitrogen, which must be added to what is derived from the atmosphere before we can obtain rich crops of grain. But a still more important source of nitrogen is in the contents of our common sewers which, from a barbarous ignorance, are commonly thrown into the sea. Were the contents of our sewers properly treated, mixed, for example, with ashes containing phosphates, and with a slight excess of diluted acids, and then dried up so as to get rid of the water they contain, without permitting the escape of ammonia—they might readily be obtained free from all offensive odour, and in a form admitting of transportation to any distance. Such a mixture would surpass all manures hitherto tried, as it would contain precisely what is required to yield the richest crops of grain.

Our readers, we trust, are by this time convinced that the principles of rational Agriculture are within the domain of science, and that, from science alone, when called in to aid the zealous Agriculturist, can we hope for real and permanent improvement. In the present work, Mr. Liebig has pointed out the path to be pursued, and has amply vindicated the claim of science to be considered the best guide, by correcting the erroneous views, hitherto prevailing, of the sources whence plants derive their nourishment, by developing the true causes of fertility in soils, and, finally, by establishing, on a firm basis, the true doctrine of manures.

LIEBIG'S ORGANIC CHEMISTRY.

Agriculture is the true foundation of all trade and industry—it is the foundation of the riches of States. But a rational system of Agriculture cannot be formed without the application of scientific principles; for such a system must be based on an exact acquaintance with the influence of soils, and action of manure upon them. This knowledge we must seek from chemistry, which teaches the mode of investigating the composition, and of studying the characters of the different substances from which plants derive their nourishment.

OF THE CONSTITUENT ELEMENTS OF PLANTS.

Carbon enters into the composition of all plants, and of all their different parts or organs.

The substances which constitute the principal mass of every vegetable are compounds of carbon with oxygen and hydrogen in the proper relative proportions for forming water.

Sugar formed of carbon and water.

Woody fibre, starch, sugar, and gum, for example, are such compounds of carbon with the elements of water. In another class of substances containing carbon as an element, oxygen and hydrogen are again present; but the proportion of oxygen is greater than would be required for producing water by union with the hydrogen. The numerous organic acids met with in plants, belong, with few exceptions, to this class.

A third class of vegetable compounds contain carbon and hydrogen, but no oxygen, or less of that element than would be required to convert all the hydrogen into water. These may be regarded as compounds of carbon with the elements of water, and an excess of hydrogen. Such are the volatile and fixed oils, wax, and the resins. Many of them have acid characters.

The juices of all vegetables contain organic acids, generally combined with the inorganic bases, or metallic oxides ; for these metallic oxides exist in every plant, and may be detected in its ashes after incineration.

Nitrogen forms gluten and albumen.

Nitrogen is an element of vegetable albumen and gluten ; it is a constituent of the acids, and of what are termed "the indifferent substances" of plants, as well as of those peculiar vegetable compounds, which possess all the properties of metallic oxydes, and are known as "organic bases."

Estimated by its proportional weight, nitrogen forms only a very small part of plants, but it is never entirely absent from any part of them. Even when it does not absolutely enter into the composition of a particular part or organ, it is always to be found in the fluids which pervade it.

It follows from the facts thus far detailed, that the development of a plant requires the presence—first, of substances containing carbon and nitrogen, and capable of yielding these elements to the growing organism ; secondly, of water and its elements; and lastly, of a soil to furnish the inorganic matters, which are likewise essential to vegetable life.

ON THE ASSIMILATION OF CARBON.

Other considerations, of a higher nature, confute the common view respecting the nutritive office of humic acid, in a manner so clear and conclusive that it is difficult to conceive how it could have been so generally adopted.

" Here follows a calculation of the average annual produce of one Hessian acre of average land, in the different shapes of wood, meadow-hay, corn, and beet-root; the land in the two latter cases being manured; in the two former, the forest and meadow, not manured. Notwithstanding the vast difference in bulk, weight, and shape, in these different forms of produce, the quantity of carbon in each is almost exactly the same, namely, about 1000lbs. per acre."

It must be concluded, from these incontestible facts, that equal surfaces of cultivated land on an average fertility, produce equal quantities of carbon; yet, how unlike have been the different conditions of the growth of the plants from which this has been deduced!

Let us now inquire whence the grass in a meadow, or the wood in a forest, receives its carbon since there no manure—no carbon—has been given to it as nourishment?—and how it happens, that the soil, thus exhausted, instead of becoming poorer, becomes every year richer in this element?

Carbon augments in the soil though no manure added, and though part of the produce carried away.

A certain quantity of carbon is taken away every year from the forest or meadow, in the form of wood or hay, and, in spite of this, the quantity of carbon in the soil augments—it becomes richer in humus.

It is said, that, in fields and orchards, all the carbon which may have been taken away as herbs, as straw, as seeds, or as fruit, is replaced by means of manure; and yet this soil produces no more carbon than that of the forest or meadow where it is never replaced. It cannot be conceived that the laws for the nutrition of plants are changed by culture,—that the sources of carbon for fruit or grain, and for grass or trees, are different.

It is not denied that manure exercises an influence upon the development of plants, but it may be affirmed, with positive certainty, that it neither serves for the production of the carbon, nor has any influence upon it, because we find that the quantity of carbon, produced by manured lands, is not greater than that yielded by lands which are not manured. The discussion as to the manner in which manure acts has nothing to do with the present question, which is, the origin of the carbon. The carbon must be derived from other sources; and as the soil does not yield it, it can only be extracted from the atmosphere.

Whence do vegetables derive their carbon? and in what form is the carbon contained in the atmosphere?

These two questions involve the consideration of two most remarkable natural phenomena, which, by their reciprocal and uninterrupted influence, maintain the life of the individual animals and vegetables, and the continued existence of both kingdoms of organic nature.

It is quite evident that the quantities of carbonic acid, and of oxygen in the atmosphere, which remain unchanged by lapse of time, must stand in some fixed relation to one another; a cause must exist, which prevents the increase of carbonic acid, by removing that which is constantly forming; and there must be some means of replacing the oxygen, which is removed from the air by the processes of combustion and putrefaction, as well as by the respiration of animals. Both these causes are united in the process of vegetable life.

The facts stated in the preceding pages prove, that the carbon of plants must be derived exclusively from the atmosphere. Now, carbon exists in the atmosphere only in the form of carbonic acid; and, therefore, in a state of combination with oxygen.

It has been already mentioned likewise, that carbon and the elements of water, form the principal constituents of vegetables; the quantity of the substances which do not possess this composition being in very small proportion. Now, the relative quantity of oxygen in the whole mass (of vegetables) is less than in carbonic acid. It is, therefore, certain, that plants must possess the power of decomposing carbonic acid, since they appropriate its carbon for their own use. The formation of their principal component substances must necessarily be attended with the separation of the carbon of the carbonic acid from the oxygen, which must be returned to the atmosphere, whilst the carbon enters into combination with water or its elements. The atmosphere must thus receive a volume of oxygen for every volume of carbonic acid which has been decomposed.

The life of plants is closely connected with that of animals, in a most simple manner, and for a wise and sublime purpose. Plants not only afford the means of nutrition for the growth and continuance of animal organization, but they likewise furnish that which is essential for the support of the important vital process of respiration; for besides separating all noxious matters from the atmosphere, they are an inexhaustible source of pure oxygen, which supplies the loss which the air is constantly sustaining. Animals, on the other hand, expire carbon, which plants inspire, and thus the composition of the medium in which both exist, namely, the atmosphere, is maintained constantly unchanged.

It may be asked, is the quantity of carbonic acid in the atmosphere, which scarcely amounts to one-tenth per cent, sufficient for the wants of the whole vegetation on the surface of the earth—is it possible that the carbon of plants has its origin from the air alone? This question is very easily answered. It is known; that a column of air of 2216lbs. weight, Hessian measure, rests upon every square Hessian foot of the surface of the earth; the diameter of the earth, and its superficies are likewise known, so that the weight of the atmosphere can be calculated with the greatest exactness. The thousandth part of this is carbonic acid, which contains upwards of 27 per cent. of carbon. By this calculation, it can be shown, that the atmosphere contains 3000 billion Hessian lbs. of carbon—a quantity which amounts to the weight of more than all the plants, and of all the strata of mineral and brown coal, which exist upon the earth. This carbon is, therefore, more than adequate for all the purposes for which it is required. The quantity of carbon in sea water is proportionally still greater.

The atmosphere, the true source of carbon in plants.

The proper, constant, and inexhaustible sources of oxygen gas are the tropics and warm climates, where a sky, seldom clouded, permits the glowing rays of the sun to shine upon an immeasurably luxuriant vegetation. The temperate and cold zones, where artificial warmth must replace the deficient heat of the sun, produce, on the contrary, carbonic acid in superabundance, which is expended in the nutrition of tropical plants. The same stream of air which moves by the revolution of the earth from the equator to the poles, brings to us in its passage from the equator, the oxygen generated there, and carries away the carbonic acid formed during our winter.

Plants thus improve the air, by the removal of the carbonic acid, and by the renewal of oxygen, which is immediately applied to the use of man and animals.

How does it happen, it may be asked, that the absorption of carbon from the atmosphere by plants is doubted by all botanists and vegetable physiologists, and that by the greater number the purification of the air by means of them is wholly denied? These doubts have arisen from the action of plants on the air in the absence of light, that is, during the night.

It is true that the decomposition of carbonic acid is arrested by absence of light. But then, namely, at night, a true chemical process commences, in consequence of the action of the oxygen in the air, upon the organic substances composing the leaves, blossoms, and fruit. This process is not at all connected with the life of the vegetable organism, because it goes on in a dead plant exactly as in a living one.

Most vegetable physiologists have connected the emission of carbonic acid, during the night, with the absorption of oxygen from the atmosphere, and have considered it a true process of respiration in plants, similar to that of animals, and, like it, having for its result the separation of carbon from some of its constituents. This opinion has a very weak and unstable foundation. The carbonic acid, which has been absorbed by the leaves and by the roots, together with water, ceases to be decomposed on the departure of day-light; it is dissolved in the juices which pervade all parts of the plant, and escapes every moment through the leaves, in quantity corresponding to that of the water which evaporates.

The richer the soil the moister it is.

A soil, in which plants vegetate vigorously, contains a certain quantity of moisture, which is indispensably necessary to their existence.—Carbonic acid, likewise, is always present in such a soil, whether it has been abstracted from the air, or has been generated by the decay of vegetable matter. Rain and well water, as well as that from other sources, invariably contain carbonic acid. Plants, during their life, constantly possess the power of absorbing, by their roots, moisture, and, along with it, air and carbonic acid. Is it, therefore, surprising that the carbonic acid should be returned unchanged to the atmosphere, along with water, when light (the cause of the fixation of its carbon) is absent? Neither this emission of carbonic acid nor the absorption of oxygen has any connexion with the process of assimilation, nor have they the slightest relation to one another, the one is a purely mechanical, the other a purely chemical process. A cotton wick, inclosed in a lamp, which contains a liquid saturated with carbonic acid, acts exactly in the same manner as a living plant in the night. Water and carbonic acid are sucked up by capillary attraction, and both evaporate from the exterior part of the wick. Plants, which live in a soil containing humus, exhale much more carbonic acid during the night than those which grow in dry situations, they also yield more in rainy than in dry weather.

The opinion is not new that the carbonic acid of the air serves for the nutriment of plants, and that its carbon is assimilated by them; it has been admitted, defended, and argued for, by the soundest and most intelligent natural philosophers, namely, Priestly, Sennebier, De Saussure, and even by Ingenhouss himself. There scarcely exists a theory in natural science, in favor of which there are more clear and decisive arguments.

ON THE ORIGIN AND ACTION OF HUMUS.

All plants and vegetable structures undergo two processes of decomposition after death. One of these is named fermentation, the other decay, putrefaction, or eremacausis. Decay is a slow process of combustion, a process therefore, in which the combustible parts of a plant unite with the oxygen of the atmosphere.

The decay of woody fibre (the principal constituent of all plants) is accompanied by a phenomenon of a peculiar kind.—This substance in contact with air or oxygen gas, converts the latter into an equal volume of carbonic acid, and its decay ceases upon the disappearance of the oxygen. If the carbonic acid is removed, and oxygen replaced, its decay recommences, that is, it again converts oxygen into carbonic acid.

That the roots and vegetable matter in the soil may decay, the presence of the atmosphere is necessary, this is effected by ploughing

Woody fibre in the state of decay is the substance called humus. The property of woody fibre to convert surrounding oxygen gas into carbonic acid, diminishes in proportion as its decay advances, and at last a certain quantity of a brown coaly-looking substance remains in which this property is entirely wanting. This substance is called *mould*, it is the product of the complete decay of woody fibre.

Humus furnishes carbonic acid

Humus acts in the same manner in a soil permable to air as in air itself, it is a continued source of carbonic acid, which it emits very slowly. An atmosphere of carbonic acid, formed at the expense of the oxygen of the air, surrounds every particle of decaying humus.

Use of ploughing

The cultivation of land, by tilling and loosening the soil, causes a free and unobstructed access of air. An atmosphere of carbonic acid is therefore, contained in every fertile soil, and is the first and most important food for the young plants which grow in it.

In spring, when those organs of plants are absent, which nature has appointed for the assumption of nourishment from the atmosphere, the component substance of the seeds is exclusively employed in the formation of the roots. Each new radicle fibril which a plant acquires, may be regarded as constituting at the same time, a mouth, a lung, and a stomach. The roots perform the functions of the leaves from the first moment of their formation; they extract from the soil their proper nutriment, namely, the carbonic acid generated by the humus. By loosening the soil which surrounds young plants, we favor the access of air, and the formation of carbonic acid, and on the other hand the quantity of their food is diminished by every difficulty which opposes the renewal of air. A plant itself affects this change of air at a certain period of its growth. The carbonic acid, which protects the undecayed humus from further change, is absorbed and taken away by the fine fibres of the roots, and by the roots themselves; this is replaced by atmospheric air, by which process the decay is renewed, and a fresh portion of carbonic acid formed. A plant at this time receives its food both by the roots, and by the organs above ground, and advances rapidly to maturity. When a plant is quite matured, and when the organs

Benefit of ploughing between young plants.

Full grown plants do not absorb carbon from the soil, but from the air

by which it obtains food from the atmosphere are formed, the carbonic acid of the soil is no longer required. Deficiency of moisture in the soil, or its complete dryness, does not now check the growth of a plant, provided it receives from the dew and the atmosphere as much as is requisite for the process of assimilation. During the heat of Summer, it derives its carbon exclusively from the atmosphere.

The size of a plant is proportional to the surface of the organs which are destined to convey food to it. A plant gains another mouth and stomach with every new fibre of root, and every new leaf. The power of absorbing nutriment from the atmosphere, with which the leaves of plants are endowed, being proportionate to the extent of their surface, every increase in the size and number of these parts is necessarily attended with an increase of nutritive power, and a consequent further developement of new leaves and branches.

Use of leaves to absorb carbonic acid.

We know that the functions of the leaves and other green parts of plants are to absorb carbonic acid, and with the aid of light and moisture, to appropriate its carbon. These processes are continually in operation; they commence with the first formation of the leaves, and do not cease with their perfect developement. But the new products arising from this continued assimilation, are no longer employed by the perfect leaves in their own immediate increase, they serve for the formation of woody fibre, and all the solid matters of similar composition.

The leaf after coming to maturity, deposits sugar

The leaves now produce *sugar*, amylin, or starch, and acids, which were previously formed by the roots when they were necessary for the developement of the stem, buds, leaves, and branches of the plant.

Each joint of the cane may be considered as the fruit ripened by each leaf, as soon as ripened the leaf decays and falls off

The organs of assimilation, at this period of their life, receive more nourishment from the atmosphere than they employ in their own sustenance, and when the formation of the woody substance has advanced to a certain extent, the expenditure of the nutriment, the supply of which still remains the same, takes a new direction, and blossoms are produced. The functions of the leaves of most plants cease upon the ripening of their fruit, because the products of their action are no longer needed. They now yield to the chemical influence of the oxygen of the atmosphere, generally suffer therefrom a change in colour, and fall off.

A peculiar transformation of the matters contained in all plants takes place in the period between blossoming and the ripening of the fruit; new compounds are produced, which furnish constituents of the blossoms, fruit, and seed. Of two compounds formed in consequence of such a change, one remains as a component part of the blossom, or fruit, while the other is separated by the roots in the form of excrementitious matter. No process of nutrition can be conceived to exist in animals or vegetables, without a separation of effete matters.

Excrements of plants and animals

Each organ extracts from the food presented to it, what it requires for its own sustenance, while the remaining elements, which are not assimilated, combine together and are separated as excrement. The excrementitious matters of one organ come in contact with another during their passage through the organism, and in consequence suffer new transformations; the useless matters rejected by one organ containing the elements for the nutrition of a second and a third organ, but at last, being capable of no further transformations, they are separated from the system by the organs destined for that purpose. In consequence of such transformations as we have described, excrements are formed of various composition; some of these contain carbon in excess, others nitrogen, and others again hydrogen and oxygen. The kidneys, liver, and lungs are organs of excretion, the first separate from the body all those substances in which a large proportion of nitrogen is contained; the second, those with an excess of carbon; and the third, such as are composed principally of oxygen and hydrogen. All superabundant nitrogen is eliminated from the body, as a liquid excrement, through the urinary passages; all solid substances, incapable of further transformation, pass out by the intestinal canal, and all gaseous matters by the lungs.

Excrements deposited in the soil.

Carbon returned to the soil as excrements equal to what was abstracted as carbonic acid.

The power to effect transformations does not belong to the vital principle, each transformation is owing to a disturbance in the attraction of the elements of a compound, and is consequently, a purely chemical process. Transformations of existing compounds are constantly taking place during the whole life of a plant, in consequence of which, and as the results of these transformations, there are produced gaseous matters which are excreted by the leaves and blossoms, solid excrements deposited in the bark, and fluid soluble substances which are eliminated by the roots. Such secretions are most abundant immediately before the formation and during the continuance of the blossoms; they diminish after the developement of the fruit. Substances, containing a large proportion of carbon, are excreted by the roots and absorbed by the soil. Through the expulsion of these matters unfitted for nutrition, therefore, the soil receives again the greatest part of the carbon, which it had at first yielded to the young plants as food, in the form of carbonic acid.

The soluble matter, thus acquired by the soil, is still capable of decay and putrefaction, and, by undergoing these processes, furnishes renewed sources of nutrition to another generation of plants, it becomes *humus*. The leaves of trees, which fall in the forest in autumn, and the old roots of grass in the meadow, are likewise converted into humus by the same influence; a soil receives more carbon in this form, than its decaying humus has lost as carbonic acid.

Humus increases in the soil, unless the produce carried away.

Plants do not exhaust the carbon of a soil, in the normal condition of their growth; on the contrary, they add to its quantity. But if it be true that plants give back more carbon to a soil than they take from it, it is evident that their growth must depend upon the reception of nourishment from the atmosphere. The influence of humus upon the growth of plants is explained by the foregoing facts, in the most clear and satisfactory manner.

Real use of humus.

Humus does not nourish plants by being taken up and assimilated in its unaltered state, but by presenting a slow and lasting source of carbonic acid, which is absorbed by the roots, and is the principal nourishment of young plants at a time when, being destitute of leaves, they are unable to extract food from the atmosphere.

ON THE ASSIMILATION OF HYDROGEN.

It has been mentioned at a former page, that pure woody fibre contains carbon and the component parts of water, but that ordinary wood contains more hydrogen than corresponds to this proportion. This excess is owing to the presence of the green principle of the leaf, wax, resin, and other bodies rich in hydrogen. Water must be decomposed, in order to furnish the excess of this element, and consequently one equivalent of oxygen must be given back to the atmosphere for every equivalent of hydrogen appropriated by a plant to the production of those substances. Water is a remarkable combination of two elements, which have the power to separate themselves from one another, in innumerable processes, in a manner imperceptible to our senses. Most vegetable structures contain hydrogen in the form of water, which can be separated as such, and replaced by other bodies, but the hydrogen which is essential to their constitution cannot possibly exist in the state of water.

All the hydrogen necessary for the formation of an organic compound is supplied to a plant by the decomposition of water. The process of assimilation, in its most simple form, consists in the extraction of hydrogen from water, and carbon from carbonic acid, in consequence of which, either all the oxygen of the water and carbonic acid is separated, as in the formation of caoutchouc, the volatile oils which contain no oxygen, and other similar substances, or only a part of it is exhaled.

ON THE ORIGIN AND ASSIMILATION OF NITROGEN.

We cannot suppose that a plant would attain maturity, even in the richest vegetable mould, without the presence of matter containing nitrogen, since we know that nitrogen exists in every part of the vegetable structure. The first and most important question to be solved therefore is, how, and in what form does nature furnish nitrogen to vegetable albumen, and gluten to fruits and seeds! The question is susceptible of a very simple solution. Plants, as we know, grow perfectly well in pure charcoal, if supplied at the same time with rain-water. Rain-water can contain nitrogen only in two forms, either as dissolved atmospheric air, or as ammonia. Now, the nitrogen of the air cannot be made to enter into combination with any element, except oxygen. even by employment of the most powerful chemical means. We have not the slightest reason for believing that the nitrogen of the atmosphere takes part in the processes of assimilation of plants and animals ; on the contrary, we know that many plants emit the nitrogen, which is absorbed by their roots, either in the gaseous form, or in solution in water. But there are on the other hand numerous facts, showing that the formation in plants, of substances containing nitrogen, such as gluten, takes place in proportion to the quantity of this element which is conveyed to their roots in the state of ammonia, derived from the putrefaction of animal matter.

The atmosphere the source of nitrogen.

The nitrogen of putrified animals is contained in the atmosphere as ammonia. Ammonia is of extreme solubility in water. Ammonia, therefore, cannot remain long in the atmosphere, as every shower of rain must condense it, and convey it to the surface of the earth.—Hence, also, rain-water must, at all times, contain ammonia, though not always in equal quantity.

Rain the medium of furnishing ammonia where liquid manure not used.

The ammonia of the atmosphere sufficient for green, but not for corn crops.

If a pound of rain-water contain only one fourth of a grain of ammonia, then a field of 40,000 square feet must receive annually upwards of 80lbs of ammonia, or 65lbs. of nitrogen ; for, by the observations of Schubber, which were formerly alluded to, about 700,000lbs. of rain fall over this surface in four months, and consequently the annual fall must be 2,500,000lbs.—This is much more nitrogen than is contained in the form of vegetable albumen and gluten, in 2650lbs. wood, 2800lbs. of hay, or 200 cwt. of beet-root, which are the yearly produce of such a field, but it is less than the straw, roots, and grain of corn which might grow on the same surface, would contain.

Experiments made with the greatest care and exactness, have placed the presence of ammonia in rain-water beyond all doubt. It has hitherto escaped observation, because no person thought of searching for it. The sensation which is perceived upon moistening the hand with rain-water, so different from that produced by pure distilled water, and to which the term *softness* is vulgarly applied, is also due to the carbonate of ammonia contained in the former.

In the manufactories of beet-root sugar, many thousand cubic feet of juice are daily purified with lime, in order to free it from vegetable albumen and gluten, and it is afterwards evaporated for crystallization. Every person, who has entered such a manufactory, must have been astonished at the great quantity of ammonia which is volatalized along with the steam.

The smell more perceptible in tainted liquor.

This ammonia must be contained in the form of an ammoniacal salt, because the neutral juice possesses the same characters as the solution of such a salt in water; it acquires, viz., an acid reaction during evaporation, in consequence of the neutral salt being converted by loss of ammonia into an acid salt. The free acid which is thus formed is a source of loss to the manufacturer of sugar from beet-root, by changing a part of the sugar into uncrystallizable grape sugar and syrup.

The same results in boiling sugar from plant canes heavily matured.

When land is fly-penned the crop of corn is always large on account of the liquid manure, and thus a great part of the ammonia which would make the cane rank, and prevent its juice from crystallising is removed

The employment of animal manure in the cultivation of grain, and the vegetables which serve for fodder to cattle, is the most convincing proof that the nitrogen of vegetables is derived from ammonia. An increase of animal manure gives rise not only to an increase in the number of seeds, but also to a most remarkable difference in the proportion of the gluten which they contain. Animal manure, as we shall afterwards show, acts only by the formation of ammonia. Putrid urine is employed in Flanders as a manure, with the best results. During the putrefaction of urine, ammoniacal salts are formed in large quantity, it may be said exclusively, for under the influence of heat and moisture, urea, the most prominent ingredient of the urine is converted into carbonate of ammonia. The barren soil on the coast of Peru is rendered fertile by means of a manure called Guano, which is collected from several islands in the south sea. It is sufficient to add a small quantity of Guano to a soil, which consists only of sand and clay in order to procure the richest crops of maize. The soil itself does not contain the smallest particle of organic matter, and the manure employed is formed only of *urate, phosphate, oxalate, and carbonate of ammonia,* together with a few earthy salts.

Guano for corn, not for green crops.

The solid excrements of animals contain comparatively very little nitrogen.

When a field is manured with animal excrements, a smaller quantity of matter containing nitrogen is added to it than has been taken from it in the form of grass, herbs, or seeds. By means of manure, an addition only is made to the nourishment which the air supplies.

A heap of manure lying unemployed upon his land would no more serve him than his neighbours. The nitrogen in it would escape as carbonate of ammonia into the atmosphere, and a mere carbonaceous residue of decayed plants would, after some years, be found in its place.

All animal excrements emit carbonic acid and ammonia, as long as nitrogen exists in them. This ammonia evolved from manure is imbibed by the soil either in solution in water, or in the gaseous form, and plants thus receive a larger supply of nitrogen than is afforded to them by the atmosphere.

Wild plants obtain more nitrogen from the atmosphere in the form of ammonia than they require for their growth. Cultivated plants receive the same quantity of nitrogen from the atmosphere as trees, shrubs, and other wild plants, but this is not sufficient for the purposes of agriculture. Agriculture differs essentially from the cultivation of forests, inasmuch as its principal object consists in the production of nitrogen under any form capable of assimilation, whilst the object of forest culture is confined principally to the production of carbon.

The cane the same

The object of cane cultivation similar to forest, namely in the cultivation of carbon and sugar.

Liquid animal excrements, such as urine, with which the solid excrements are impregnated, contain the greatest part of their ammonia in the state of salts, in a form, therefore, in which it has completely lost its volatility: when presented in this condition not the smallest portion of the ammonia is lost to the plants, it is all dissolved by water, and imbibed by their roots.

Powdered charcoal surpasses all other substances in the power which it possesses of condensing ammonia within its pores, particularly when it has been previously heated to redness. Charcoal absorbs ninety times its volume of ammoniacal gas, which may be again separated by simply moistening it with water. Decayed wood approaches very nearly to charcoal in this power; decayed oakwood absorbs seventy-two times its volume, after having been completely dried under the air-pump. We have here an easy and satisfactory means of explaining still further the properties of humus, or wood in a decaying state. It is not only a slow and constant source of carbonic acid, but it is also a means by which the necessary nitrogen is conveyed to plants.

Humus attracts nitrogen from the atmosphere.

We find this nitrogen in the atmosphere, in rain water, and in all kinds of soils, in the form of ammonia, as a product of the decay and putrefaction of preceding generations of animals and vegetables. We find likewise that the proportion of azotised matters in plants is augmented by giving them a larger supply of ammonia, conveyed in the form of animal manure.

No conclusion then can have a better foundation than this, that it is the ammonia of the atmosphere, which furnishes nitrogen to plants.

Carbonic acid, water, and ammonia, contain the elements necessary for the support of animals and vegetables. The same substances are the ultimate products of the chemical processes of decay and putrefaction. All the innumerable products of vitality, resume, after death, the original form from which they spring. And thus death—the complete dissolution of an existing generation—becomes the source of lime for a new one. But another question arises,—are the conditions already considered the only ones necessary for the life of vegetables? It will be shown that they are not.

OF THE INORGANIC CONSTITUENTS OF PLANTS.

Carbonic acid, water, and ammonia, are necessary for the existence of plants, because they contain the elements from which their organs are formed; but other substances are likewise requisite for the formation of certain organs destined for special functions peculiar to each family of plants. Plants obtain these substances from inorganic nature. In the ashes left after the incineration of plants, the same substances are found, although in a changed condition.

Many of these inorganic constituents vary according to the soil in which the plants grow, but a certain number of them are indispensable to their developement. All substances in solution in a soil are absorbed by the roots of plants, exactly as a sponge imbibes a liquid, and all that it contains, without selection. The substances thus conveyed to plants are retained in greater or less quantity, or are entirely separated when not suited for assimilation.

Such constituents exist in small quantity in those parts of a plant in which the process of assimilation is most active, as in the mass of woody fibre; and their quantity is greater in those organs, whose office it is to prepare substances conveyed to them for assimilation by other parts. The leaves contain more inorganic matters than the branches, and the branches more than the stem.

The long tops should not be carried away, as the inorganic parts are wanted for next crop.

The perfect developement of a plant, according to this view, is dependent on the presence of alkalies or alkaline earths; for when these substances are totally wanting, its growth will be arrested, and when they are only deficient, it must be impeded.

In order to apply these remarks, let us compare two kinds of trees, the wood of which contain unequal quantities of alkaline bases, and we shall find that one of these grows luxuriantly in several soils, upon which the others are scarcely able to vegetate. For example, ten thousand parts of oakwood yield two hundred and fifty parts of ashes, the same quantity of firwood only eighty-three, of linden wood five hundred, of rye four hundred and forty, and of the herb of the potatoe-plant one thousand five hundred parts.

Firs and pines find a sufficient quantity of alkalies in granitic and barren sandy soils, in which oaks will not grow; and wheat thrives in soils favourable for the linden-tree, because the bases, which are necessary to bring it to complete maturity, exist there in sufficient quantity. The accuracy of these conclusions, so highly important to Agriculture and to the cultivation of forests, can be proved by the most evident facts.

All kinds of grasses, contain in the outer part of their leaves and stalk, a large quantity of silicic acid and potash, in the form of acid silicate of potash. The proportion of this salt does not vary perceptibly in the soil of corn-fields, because it is conveyed to them as manure in the form of putrefying straw. But this is not the case in a meadow, and hence we never find a luxuriant crop of grass on sandy and calcareous soils, which contain little potash, evidently because one of the constituents indispensable to the growth of the plants is wanting. Soils formed from basalt, grauwacke, and porphyry, are *cœteris paribus*, the best for meadow land, on account of the quantity of potash, which enters into their composition. The potash abstracted by the plants is restored during the annual irrigation.

But when we increase the crop of grass in a meadow by means of Gypsum, we remove a greater quantity of potash with the hay than can, under the same circumstances, be restored. Hence it happens, that, after the lapse of several years, the crops of grass on the meadows manured with Gypsum, diminish, owing to the deficiency of potash. But if the meadow be strewed, from time to time, with wood ashes, even with the lixiviated ashes which have been used by soap-boilers, then the grass thrives as luxuriantly as before. The ashes are only a means of restoring the potash. The leaves and small branches of trees contain the most potash.

Stokehole ashes to be returned to the soil.

There are vineyards on the Rhine, the plants of which are above a hundred years old, and all of these have been cultivated by manuring them with cow-dung, a manure containing a large proportion of potash, although very little nitrogen.

All the potash, in fact, which is contained in the food consumed by a cow is again immediately discharged in the excrements.

THE ART OF CULTURE.

The conditions necessary for the life of all vegetables have been considered in the preceding part of the work. Carbonic acid, ammonia, and water, yield elements for all the organs of plants. Certain inorganic substances—salts and metallic oxides—serve peculiar functions in their organism, and many of them must be viewed as essential constituents of particular parts.

The atmosphere and the soil offer the same kind of nourishment to the leaves and roots. The former contains a comparatively nexhaustible supply of carbonic acid and ammonia; the latter, by means of its humus, generates constantly fresh carbonic acid.

When kept in a dry place, humus may be preserved for centuries, but when moistened with water, it converts the surrounding oxygen into carbonic acid. Its decay proceeds only when plants grow in the soil containing it; for they absorb by their roots the carbonic acid as it is formed. The soil receives again from living plants (as excrements) the carbonaceous matter it thus loses, so that the proportion of humus in it does not decrease.

All plants die in soils and water which contain no oxygen; absence of air acts exactly in the same manner as an excess of carbonic acid. Stagnant water on a marshy soil excludes air, but a renewal of water has the same effect as a renewal of air, because water contains it in solution. If the water is drawn from a marsh, free access is given to the air, and the marsh is changed into a fruitful meadow.

Benefit of draining

In a soil to which the air has no access, or at most but very little, the remains of animals and vegetables do not decay, for they can only do so when freely supplied with oxygen; but they undergo putrefaction, for which air is present in sufficient quantity.

Benefit of ploughing.

The frequent renewal of air by ploughing, and the preparation of the soil, especially its contact with alkaline metallic oxides, the ashes of brown coal, burnt lime, or limestone, change the putrefaction of its organic constituents, into a pure process of oxydation; and, from the moment all the organic matter existing in a soil enters into a state of oxydation or decay, its fertility is increased. The oxygen is no longer employed for the conversion of the brown soluble matter into the insoluble coal of humus, but serves for the formation of carbonic acid.

Use of humus to young plants.

Humus supplies young plants with nourishment by the roots until their leaves are matured sufficiently to act as exterior organs of nutrition ; its quantity heightens the fertility of a soil, by yielding more nourishment in this first period of growth, and consequently by increasing the number of organs of atmospheric nutrition. Those plants, which receive their first food from the substance of their seeds, such as bulbous plants, could completely dispense with humus ; its presence is useful only in so far as it increases and accelerates their developement, but it is not necessary ; indeed an excess of it at the commencement of their growth is, in a certain measure, injurious.

Reason why Canes in rich land dont arrow.

The amount of food which young plants can take from the atmosphere in the form of carbonic acid and ammonia is limited ; they cannot assimilate more than the air contains. Now, if the quantity of their stems, leaves, and branches has been increased by the excess of food yielded by the soil at the commencement of of their developement, they will require for the completion of their growth, and for the formation of their blossoms and fruits, more nourishment from the air than it can afford and consequently they will not reach maturity. In many cases the nourishment afforded by the air, under these circumstances, suffices only to complete the formation of the leaves, stems, and branches. The same result then ensues as when ornamental to larger ones, in which their roots are permitted to increase and multiply. All their nourishment is employed for the increase of their roots and leaves; they spring, as it is said, into a herb or weed, but do not blossom.

Neither will the sugar in each joint of the cane be perfected till the leaf is completely matured.

Upon the blossoming of the Sugar Cane, part of the sugar disappears, and it has been ascertained, that the sugar does not accumulate in the beet-root until after the leaves are completely formed.

Carbonic acid, water, and ammonia, are the food of fully developed plants ; starch, sugar, aud gum, serve, when accompanied by an azotized substance, to sustain the embryo, until its first organs of nutrition are unfolded.

In whatever form we supply plants with those substances which are the products of their own action, in no instance do they appear to have any effect upon their growth, or to replace what they have lost. Sugar, gum, and starch, are not the food of plants, and the same must be said of humic acid, which is so closely allied to them in composition.

If we now direct our attention to the particular organs of plant, we find every fibre and every particle of wood surrounded by a juice containing an azotized matter; while the starch granules and sugar are inclosed in cells, formed of a substances containing nitrogen. Indeed, everywhere, in all the juices of the fruits and blossoms, we find a substance, destitute of nitrogen, accompanied by one that contains that element.

Cells for the deposit of sugar in the cane.

The wood of the stem cannot be formed, *quasi* wood, in the leaves, but another substance must be produced, which is capable of being transformed into wood. This substance must be in a state of solution, and accompanied by a compound, containing nitrogen: it is very probable, that the wood and the vegetable gluten, the starch granules, and the cells containing them, are formed simultaneously, and, in this case, a certain fixed proportion between them would be a condition necessary for their production.

According to this view, the assimilation of the substances generated in the leaves will (cæteris paribus) depend on the quantity of nitrogen contained in the food. When a sufficient quantity of nitrogen is not present to aid in the assimilation of the substances which do not contain it, these substances will be separated as excrements from the bark, root, leaves, and branches.

It will be evident from the preceding considerations, that the products generated by a plant may vary exceedingly, according to the substances given it as food. A superabundance of carbon in the state of carbonic acid conveyed through the roots of plants, without being accompanied by nitrogen, cannot be converted either into gluten, albumen, wood, or any other component part of an organ; but either it will be separated in the form of excrements, such as sugar, starch, oil, wax, resin, mannite, or gum, or these substances will be deposited in greater or less quantity in the wide cells and vessels.

A superabundance of carbon to the supply of nitrogen will cause sugar to be deposited in the cells

The quantity of gluten, vegetable albumen, and mucilage, will augment when plants are supplied with an excess of food containing nitrogen; and ammoniacal salts will remain in the sap, when, for example, in the culture of the beet, we manure the soil with a highly nitrogenous substance, or when we suppress the functions of the leaves, by removing them from the plant.

Fly-penning furnishes an excess of nitrogen and causes the formation of molasses instead of sugar

Pulling off green leaves when trashing canes creates molasses instead of sugar

The quantity of starch in potatoes increases, when the soil

Effect of vegetable compared with animal manures in the formation of starch or sugar

contains much humus, but decreases when the soil is manured with strong animal manure, although then the number of cells increases, the potatoes acquiring in the first case a mealy, in the second a soapy consistence. Beet roots taken from a barren sandy soil contain a maximum of sugar, and no ammoniacal salts.

There is no profession which can be compared in importance with that of agriculture ; for to it belongs the production of food for man and animals ; on it depends the welfare and developement of the whole human species, the riches of States, and all commerce. There is no other profession in which the application of correct principles is productive of more beneficial effects, and is of greater and more decided influence.

It is the duty of the Chemist to explain the composition of a fertile soil, but the discovery of its proper state or condition belongs to the Agriculturist.

Pure sand and pure lime-stone, in which there are no other inorganic substances, except silicious earth, carbonate or silicate of lime, form absolutely barren soils. But argillaceous earths form always a part of fertile soils. Now, from whence come the argillaceous earths in arable land; what are their constituents, and what part do they play in favoring vegetation ? They are produced by the disintegration of aluminous minerals by the action of the weather.

It is known that the aluminous minerals are the most widely diffused on the surface of the earth, and, as we have already mentioned, all fertile soils, or soils capable of culture, contain alumina as an invariable constituent. There must, therefore, be something in aluminous earth, which enables it to exercise an influence on the life of plants, and to assist in their developement. The property on which this depends is that of its invariably containing potash and soda.

Land of the greatest fertility contains argillaceous earths, and other disintegrated minerals with chalk and sand, in such a proportion as to give free access to air and moisture.

Air, water, and the change of temperature prepare the different species of rocks for yielding to plants the alkalies which they contain. A soil which has been exposed for centuries, to all the influences which effect the disintegration of rocks, but from which the alkalies have not been removed, will be able to afford the means of nourishment to those vegetables, which require alkalies for their growth during many years; but it must gradually become exhausted, unless those alkalies which have been removed are again replaced ; a period, therefore, will arrive, when it will be necessary to expose it, from time to time, to a further disintegration, in order to obtain a new supply of soluble alkalies. Fallow is the term applied to land left at rest for a further disintegration. It is the greatest possible mistake to suppose that the temporary diminution of fertility in a soil is owing to the loss of humus ; it is the mere consequence of the exhaustion of the alkalies.

Benefit of fallowing.

In stokehole ashes we return the alkalies, but by ploughing between the Canes annually, we disintegrate as much fresh alkali as we carry away in the body of the Cane,

Let us consider the condition of the country around Naples, which is famed for its fruitful corn-land ; the farms and villages are situated from eighteen to twenty-four miles distant from one another, and between them there are no roads, and consequently no transportation of manure. Now, corn has been cultivated on this land for thousands of years, without any part of that which is annually removed from the soil being artificially restored to it. How can any influence be ascribed to humus, under such circumstances, when it is not even known whether humus was ever contained in the soil ? The method of culture in that district completely explains the permanent fertility. It appears very bad in the eyes of our Agriculturists, but there it is the best plan which could be adopted. A field is cultivated once every three years, and is, in the intervals, allowed to serve as a sparing pasture for cattle. The soil experiences no change in the two years, during which it there lies fallow, further than that it is exposed to the influence of the weather, by which a fresh portion of the alkalies contained in it are again set free, or rendered soluble. The animals fed on these fields yield nothing to those soils, which they did not formerly possess. The weeds upon which they live spring from the soil, and that which they return to it as excrement, must always be less than that which they extract. The fields, therefore, can have gained nothing from the mere feeding of cattle upon them ; on the contrary, the soil must have lost some of its constituents.

All plants of the grass kind require silicate of potash.

Phosphoric acid has been found in the ashes of all plants hitherto examined, and always in combination with alkalies or alkaline earths.

Some plants, however, extract other matters from the soil, besides silica, potash, and phosphoric acid, which are essential constituents of the plants ordinarily cultivated.

The fallow-time, as we have already shown, is that period of culture, during which land is exposed to a progressive disintegration, by means of the influence of the atmosphere, for the purpose of rendering a certain quantity of alkalies capable of being appropriated by plants. Now, it is evident, that the careful tillage of fallow land must increase and accelerate this disintegration.

Constant tillage beneficial

It is evident that two plants growing beside each other will naturally injure one another, if they withdraw the same food from the soil. Plants will, on the contrary, thrive beside each other, either when the substances necessary for their growth, which they extract from the soil are of different kinds, or when they themselves are not both in the same stages of development at the same time.

OF THE INTERCHANGE OF CROPS.

Theoretical considerations on the process of nutrition, as well as the experience of all Agriculturists, so beneficially illustrated by the experiments of Macaire-Princep, leave no doubt that substances are excreted from the roots of plants, and that these matters form the means by which the carbon, received from humus in the early period of their growth, is restored to the soil.

When substances, which are incapable of being employed in the nutrition of a plant, exist in the matter absorbed by its roots, they must be again returned to the soil. Such excrements might be serviceable, and even indispensable to the existence of several other plants. But substances that are formed in a vegetable organism, during the process of nutrition, which are produced, therefore; in consequence of the formation of woody fibre, starch, albumen, gum, acids, &c., cannot again serve in any other plants to form the same constituents of vegetables.

The substances which Decandolle viewed as excrements, belonged to the soil; they were undigested matters, which, although not adapted for the nutrition of one plant, might yet be indispensable to another. Those matters, on the contrary, designated as excrements by Macaire-Princep, could only, in one form, serve for the nutrition of vegetables. It is scarcely necessary to remark, that this latter excrementitious matter must undergo a change before another season. During autumn and winter, it begins to suffer a change from the influence of air and water; its putrefaction, and at length, by continued contact with the air, which tillage is the means of procuring, its decay are effected; and at the commencement of spring it has become converted, either in whole, or in part, into a substance which supplies the place of humus, by being a constant source of carbonic acid.

By horse-hoeing, we convert the excrements into humus annually.

The quickness with which this decay of the excrements of plants proceeds, depends on the composition of the soil, and on its greater or less porosity. It will take place very quickly in a calcareous soil: for the

Ploughing makes the soil porous

power of organic excrements to attract oxygen, and to putrefy is increased by contact with the alkaline constituents.

The destruction of the peculiar excrements of one crop must have taken place before a new crop can be produced.

The use of alkalies and burnt lime, or even small quantities of ashes which have not been lixiviated, must enable a soil to permit the cultivation of the same plants in a much shorter time.

We fallow, and apply ashes annually

A soil lying fallow owes its earlier fertility, in part, to the destruction or conversion into humus of the excrements contained in it, which is effected during the fallow season, at the same time that the land is exposed to a further disintegration.

Cultivation, while young

A maximum of produce in plants is always in proportion to the quantity of nutriment supplied them in the first stage of their development.

In fallowing plough in the grass and weeds.

The sowing of a field with fallow plants, such as clover, rye, buck-wheat, &c. and the incorporation of the plants, when nearly at blossom, with the soil, affect this supply of humus in so far, that young plants subsequently growing in it find, at a certain period of their growth, a maximum of nutriment, that is, matter in the process of decay.

The same end is obtained, but with much greater certainty, when the field is planted with esparsette or lucern. These plants are remarkable on account of the great ramification of their roots, and strong development of their leaves, and for requiring only a small part of inorganic matter. Until they reach a certain period of their growth, they retain all the carbonic acid and ammonia, which may have been conveyed to them by rain and the air, for that which is not absorbed by the soil is appropriated by the leaves; they also possess an extensive fourfold or sixfold surface, capable of assimilating these bodies, and of preventing the volatilization of the ammonia from the soil, by completely covering it.

The cane has a similar effect

The cause of the annual decrease in the produce of the cane from the increasing quantity of nitrogen.

An immediate consequence of the production of the green principle of the leaves, and of their remaining component parts, as well as of those of the stem, is the equally abundant excretion of organic matters into the soil from the roots. The favorable influence which this exercises on the land, by furnishing it with matter, capable of being converted into humus, lasts for several years, but barren spots gradually appear after the lapse of some time. Now, it is evident, that, after from six to seven years, the ground must become so impregnated with the excrements, that every fibre of the root will be surrounded with them. As they remain for some time in a soluble condition, they must absorb part of them, and suffer injurious effects in consequence, because they are incapable of assimilation. When such a field is observed for several years, it is seen that the barren spots are again covered with vegetation, (the same plants being always supposed to be grown,) whilst new spots become bare and apparently unfruitful, and so on alternately. The causes which produce this alternate barrenness and fertility in the different parts of the land are evident. The excrements upon the barren spots receiving no new addition, and being subjected to the influence of air and moisture, they pass into putrefaction, and their injurious influence ceases. The plants now find those substances, which formerly prevented their growth, removed, and in their place meet with humus, that is, vegetable matter in a state of decay.

By ploughing between the canes, we cause this effect annually

Now, although the quantity of humus in a soil may be increased to a certain degree by an artificial cultivation, still, in spite of this, there cannot be the smallest doubt that a soil must gradually lose those of its constituents, which are removed in the seeds, roots, and leaves of the plants raised upon it. The fertility of a soil cannot remain unimpaired, unless we replace in it all those substances of which it has been thus deprived. Now, this is effected by *manure.*

OF MANURE.

When it is considered that every constituent of the body of man and animals is derived from plants, and that not a single element is generated by the vital principle, it is evident that all the inorganic constituents of the animal organism must be regarded, in some respect or other, as manure. During their life, the inorganic components of plants, which are not required by the animal system, are disengaged from the organism, in the form of excrements. After their death, their nitrogen and carbon pass into the atmosphere as ammonia and carbonic acid, the products of their putrefaction, and at last nothing remains, except the phosphate of lime and other salts in their bones. Now, this earthy residue of the putrefaction of animals must be considered, in a rational system of agriculture, as a powerful manure for plants, because that which has been abstracted from a soil, for a series of years, must be restored to it, if the land is to be kept in a permanent condition of fertility.

According to the common view, the action of solid animal excrements depends on the decaying organic matters which replace the humus, and on the presence of certain compounds of nitrogen, which are supposed to be assimilated by plants, and employed in the production of gluten and other azotised substances. But this view requires further confirmation with respect to the solid excrements of animals, for they contain so small a proportion of nitrogen, that they cannot possibly, by means of it, exercise any influence upon vegetation. We must search for the nitrogen of the food, assimilated, not in the solid, but in the liquid excrements. The influence which the former exercise on the growth of vegetables does not depend upon the quantity of nitrogen which they contain.

Which then are the substances in the (solid) excrements of the cow and horse, which exert an influence on vegetation? The salts and other inorganic substances are evidently those to which our attention should be directed, for they are the same which formed the component parts of the hay, straw, and oats, with which the horse was fed. In 1000lbs. of horses'-dung, we present to a field the inorganic substances, contained in 6000lbs. of hay, or 8300lbs. of oats. This is sufficient to supply one and a half crop of wheat with potash and phosphates.

The excrements of cows and sheep, contain phosphate of lime, common salt, and silicate of lime, the weight of which varies from 9 to 28 per cent. according to the fodder which the animal receives.

It is quite certain that the vegetable constituents of the excrements, with which we manure our fields, cannot be entirely without influence upon the growth of the crops on them, for they will decay, and thus furnish carbonic acid to the young plants. But it cannot be imagined that their influence is very great, when it is considered that a good soil is manured only once every six or seven years, that the quantity of carbon thus given to the land corresponds to only five and eight-tenths per cent. of what is removed in the form of herbs, straw, and grain; and further, that the rain-water, received by a soil, contains much more carbon, in the form of carbonic acid, than these vegetable constituents of the manure. The peculiar action then of the solid excrements, is limited to their inorganic constituents, which thus restore to a soil that which is removed in the form of corn, roots, and grain.

It is evident, therefore, that the soil of a field will alter but little, if we collect and distribute the dung carefully.

We could keep our fields in a constant state of fertility by replacing every year as much as we remove from them in the form of produce; but an increase of fertility, and consequent increase of crop, can only be obtained when we add more to them than we take away.

From the foregoing remarks it will readily be inferred that for animal excrements, other substances, containing their essential constituents, may be substituted. In Flanders, the yearly loss of the necessary matters in the soil is completely restored by cover ing the fields with ashes of bones or wood, which may or may not have been lixiviated, and of which the greatest part consists of phosphates of lime and magnesia. The great importance of manuring with ashes has been long recognised by agriculturists as the result of experience.

Use of ashes as manure

Bone-manure possesses a still greater importance (than ashes) in this respect. The primary sources from which the bones of animals are derived are hay, straw, or other substances which they take as food.

It must be admitted as a principle of agriculture, that those substances which have been removed from a soil, must be completely restored to it, and whether this restoration be effected by means of excrements, ashes, or bones, is, in a great measure, a matter of indifference.

I propose to do it with ashes

We have now considered all that is requisite in a soil, in order to furnish its plants with the materials necessary for the formation of woody fibre, the grain, the roots, and the stem, and now proceed to the consideration of the most important object of Agriculture, namely, the production of nitrogen, in a form capable of assimilation—the production, therefore, of substances containing this element. The leaves, which nourish the woody matter, the roots, from which the leaves are formed, and which prepare the substances for entering into the composition of the fruit, and, in short, every part of the organism of a plant, contain azotised matter in very varying proportions, but the seeds and roots are always rich in them.

Nature, by means of the atmosphere, furnishes nitrogen to a plant in quantity sufficient for its normal growth. Now, its growth must be considered as normal, when it produces a single seed, capable of reproducing the same plant in the following year.

We may furnish a plant with carbonic acid, and all the materials which it may require, we may supply it with humus in the most abundant quantity, but it will not attain complete development, unless nitrogen is also afforded to it; herb will be formed, but no grain, even sugar and starch may be produced, but no gluten.

Exactly what is required in the Cane

We possess only one other source of manure, which acts by its nitrogen, besides the fæces of animals, namely, the urine of man and animals. Urine is employed as manure, either in the liquid state, or with the fæces which are impregnated with it. It is the urine contained in them which gives to the solid fæces the property of emitting ammonia, a property they themselves possess only in a very slight degree. When we examine what substances we add to a soil, by supplying it with urine, we find that this liquid contains, in solution, ammoniacal salts, uric acid (a substance containing a large quantity of nitrogen), and salts of phosphoric acid.

The sterile soils of the South American coast are manured with a substance called guano, consisting of urate of ammonia, and other ammoniacal salts, by the use of which a luxuriant vegetation, and the richest crops are obtained.

It is evident that if we place the solid or liquid excrements of man, or the liquid excrements of animals, on our land, in equal proportion to the quantity of nitrogen removed from it in the form of plants, the sum of this element in the soil must increase every year; for the quantity which we thus supply, another portion is added from the atmosphere.

Charcoal, in a state of powder, must be considered as a very powerful means of procuring the growth of plants on heavy soils, and particularly on such as consist of argillaceous earth.

GENERAL RULES.

A careful perusal of the foregoing extracts will, I think, satisfy any candid enquirer as to the nature of the treatment that ought to be adopted in the cultivation of the Cane. The following are the deductions I have drawn from them :—

1. That solid animal manure is not necesssary for the cultivation of the Cane.

2. That liquid manure is highly injurious.

3. That vegetable matter alone is the proper manure.

4. That long tops, or trash, should not be carried away from the field for the feeding of stock, but should be ploughed in.

5. That the stokehole ashes should be returned to the soil as manure, if the soil be not ploughed.

6. That the plough and horse-hoe should be in constant use to convert the excrements into humus, and to disintegrate fresh portions of alkalies and inorganic matter from the soil.

7. That the Canes should not be stripped of the leaves until perfectly withered.

8. That land, under a system of cultivation that destroys the excrements, and converts them into humus, and that returns to the soil the inorganic matters carried away, does not require a change of crop.

9. That the crop on land annually kept in the same condition of fertility, as at the commencement of the cultivation, should not deteriorate.

ARRANGEMENT PROPOSED FOR CARRYING THE PLAN INTO EFFECT.

These maxims being kept in view, the first consideration is, how most beneficially to carry them into effect. Under such a system, the extent of Cane-field required being very small, the land nearest to the works will be chosen as most convenient on account of the shortness of the cartage. The roads for the conveyance of Cane to the mill will be shorter, and will, therefore, be kept in good order, with more facility, and at a less expence. The fences necessary to secure the Canes from trespass will be of much less extent, and will, therefore, also be kept in permanent repair at a less outlay.

The cartage will often be shortened one half. I shall, however, reckon the saving effected at not more than one-third. I have found that the cartage of canes to the mill usually amounts to ten shillings a hogshead, or about twelve shillings a ton, of sugar, and I think the average of the island will not be less than this, although it must vary very much in different places. The saving effected in cartage will, therefore, be four shillings a ton. The expense saved in the shortened length of road and of fences to be kept in order, will be considerable, but the amount is not easily ascertained. The cane land will not be more than one half the extent usually employed; the roads and fences will, therefore, be diminished in an equal proportion. I think the expense of fencing the canes, and repairing the intervals and roads cannot, on an average, be less than six shillings a ton. Say, as in the case of the cartage, that we only calculate the saving at one third, instead of one half; it will, therefore, amount to two shillings a ton.

As it is necessary to give an idea as to the description of an estate, which will be kept in view, as a kind of standard, for making calculations by, I think such an Estate as used to make three hundred hogsheads will be the best for the purpose; but I shall endeavour, as much as possible, to make the calculations by the ton, that they may suit as many Estates as possible.

ON THE SOIL BEST SUITED FOR THE CANE.

It seems to be universally admitted that a brick-mould is the soil most favorable for the cultivation of the cane. Whether it is really the best, I cannot pretend to decide; but I can positively say, that it is an excellent soil for producing both a large quantity, and a good quality of sugar; it is one also easily cultivated by agricultural implements, and for this reason, economical It is, therefore, an object to assimilate other soils to it as nearly as possible; and it will be worth while to go to some expense to do so if the determination is come to of keeping the cane-fields constantly in cultivation. Now, what is the constitution of the soil called brick-mould? Without using technical language, it may be described as an intimate mixture of clay and sand, in such proportions as to be easily permeable to the atmosphere and rain, neither retaining moisture too long, nor allowing it to evaporate too quickly. The only soils commonly kept in cane cultivation, besides the different kinds of brick-mould, and which are capable of being ploughed, are gravelly soils and stiff clays. Gravelly soils can only be assimilated to brick-mould, by the application of large quantities of clay spread upon the soil, and well incorporated by the plough, and this is a very expensive operation. Stiff clays are more easily brought to imitate brick-mould, and with much less labour, by spreading sea-side sand on the surface of the soil, and ploughing it in. As the plough breaks the surface, the sand runs down the cracks between the clods, and prevents them from binding again —a small quantity applied this way will have a great effect.—The Sub-soil Plough following, a great part of the sand will run into the lower strata, and effectually prevent it from binding. I should say a hundred cart loads, of a cubic yard each, would be sufficient for each application; that would be a cubic foot of sand for each twenty feet of surface, and supposing that the ploughing mixes it with the soil a foot deep, it will be one foot of sand for every twenty feet of clay. This quantity will have a perceptible effect, but may be repeated again to advantage in future years.

Many Estates along the sea-side are of a very stiff clay, and have abundance of fine sand, within a short cartage, for the trouble of getting it. This application of sand is generally considered in the light of manuring; it will undoubtedly furnish fresh inorganic materials for the plants, but its chief use is in its mechanical action, by preventing the soil, when pulverised, from binding again, and keeping it permeable to the beneficial action of the atmosphere and rain. When sand is not to be had, fine gravel may be used, or marl, which contains both the inorganic and organic constituents of plants.

In making calculations for a whole country, it is not to be supposed that they can apply correctly in all circumstances; I shall make mine for such soils as can be worked with the same facility as brick-mould, which may be considered as the standard soil.

PREPARATION OF THE SOIL.

I shall confine myself, at present, to the cultivation of leve land, and land of such easy declivity as to present no real obsta lces to the free use of the Plough.

The cultivation of hilly land must be considered separately, as the system to be pursued must be different.

The preparation will, of course, be done with the Plough.

Without the soil be unusually barren, there will be no occasion for the application of manure. From what we have already read, it will be remembered that there is a large proportion of roots and excrementitious matter, besides the vegetable matter on the surface of the soil, left by the previous crop, whatever it may have been, ready to be converted into humus, and to afford nourishment to the plant whilst young, which change is accomplished by the Plough exposing it to the oxygen of the atmosphere. This humus will be sufficient nutriment for the young plant till it grow large enough to extract its nourishment from the atmosphere.

The grass having been eaten down by the stock, the Plough must fallow the land in the manner of close ploughing.

The best Plough for the purpose is Wilkie's Wrought-Iron Plough, made for four horses, and worked by six or eight cattle.—Most people work eight or ten, but I have found that six, when properly broken to the draught, are competent for turning up the soil in the dryest weather. It is better to have the plough of the strongest description, for fear or loss of time and inconvenience by the breakage of a slighter implement. The cost of the Plough is, with duplicate socks, coulters, &c., and charges out, about £14.

Ploughing is usually done in dry weather, and ought to be done at that time. It should not be attempted in wet weather, it is easiest performed when the land is half wet and half dry, or dry on the surface and moist underneath. The reason why it should be done when the land is not wet, is, that in wet weather it cannot be pulverised, but turns over in long slices, which, on exposure to the sun, harden like a brick. In such a state the atmosphere cannot penetrate to act chemically on the matters contained in the soil. So that in wet weather the soil is neither pulverised by the mechanical action of the Plough, nor acted on chemically by the atmosphere, which are the two main objects of ploughing.

If the grass be long, or the trash troublesome, fire may be run through it to facilitate the ploughing, but, if not very troublesome, it is better to have them turned in with the Plough, as all vegetable matter, whether green or dry, becomes converted very speedily into humus upon being incorporated with the soil. And, if we apply no manure, it is of consequence that we should not diminish the quantity we have naturally.

In proof of the advantages to be derived from ploughing in, and incorporating with the soil both green and dry vegetable matters lying on the surface, by way of enriching the land, if it is not already rich enough, let me quote Sir Humphry Davy and Lowe on the subject ;—

Low's Agriculture.—" An example of the application of vegetable substances in this state, (that is without animal manures,) is when certain plants are allowed to come into flower, and are then ploughed down in their green state, and mixed with the matter of the soil. Vegetable matter, when thus covered by the soil in its green and succulent state, readily undergoes decomposition, and forms a very enriching substance. The practice, however, is chiefly suited to the warmer countries where vegetation is rapid."

Sir H. Davy's Agricultural Chemistry.—Whoever will refer to the simplest plinciples of chemistry, cannot entertain a doubt on the subject (whether dung should be used fresh or rotten). As soon as the dung begins to decompose, it throws off its most volatile parts, which are the most valuable and most efficient. Dry straw of wheat, oats. barley, beans, and peas, and spoiled hay, or any other similar kind of dry vegetable matter, is, in all cases, useful manure."

I have quoted these authors in this place, in addition to the authority of Liebig, to shew the reason why I recommend the trash, grass, &c. to be ploughed in, even at some extra trouble and expense, in preference to burning them off, unless the land be already rich enough in humus without the assistance of these matters. In treating of the cultivation of ratoons I shall also have again to refer to this subject.

In preparing the land for remaining permanently in canes, some extra labour may be advantageously bestowed in forming the land into ridges of such a size and shape, as will be most beneficial for draining the land, and taking off the produce with facility. By means of the plough, the land can be rounded up so gradually that very few trenches will be required to carry off the surface water, It the old way of digging, the beds were made narrow that the people might be able to haul the dirt, with their hoes to raise up the centre of the bed ; it was generally, however, so badly done, that the beds are usually found to be low in the middle and high next each trench. Fewer trenches being necessary, from the gradual slope given to the land by the plough, I propose to throw two beds into one, each bed will then be double the width, and each trench also double the width.

My object in making the trench wide is to allow carts to travel up and down it in dry weather, for carting away the canes, instead of passing over the bed, and destroying the stools. Two ploughings in the same direction will usually accomplish this, but sometimes a third may be necessary, so as to raise the top of the bed where the trench was before. The Cane-pieces, in Plantain Garden-River district, are many of them laid out in this way, and to great advantage.

I have an additional object in laying them out on this plan, as I plough my cane-holes longways of the bed, instead of crossways, as commonly done. There is a great advantage in the plan, now-a-days, for the facility it affords for tasking the people at their work: each bed will be cleaned by itself, the size will be exactly known, and the work easily inspected; when ripe, each bed will be cut by itself, and will therefore not take more than one or two days; immediately it is cut, the wain carries away all the canes up the trench or wain-track, without going on the Cane-stools, the people burn off the trash, and the Plough commences its operation before the remainder of the piece is finished cutting. So many advantages being to be obtained, I don't think any body will object to the cost of the extra ploughing. This extra ploughing must be considered as for the permanent benefit of the estate, and not necessarily essential to any plan of cultivation.

Keeping in view that the land is to be laid out in wide beds, the first ploughing commences at the side of the small bed, and the dirt is thrown into the trench intended to be filled up; the Plough keeps working round and round the trench, till the two small beds are thrown into one large one. The width will depend on the dryness of land. As a general rule, it may be taken for granted, that the trenches have been dug in number corresponding to the wetness of the land. But whether wide or narrow it will be found that, by throwing two into one, and rounding up the bed nicely, the ground will be better drained with the wide beds worked by the Plough, than with the narrow beds worked in the old fashion. For there is a gradual slope from the centre of the bed to the trenches, and the whole of the soil being pulverized, the superfluous water will drain underneath the surface to each side.

Two trenches also being converted into one, will make the trench wide enough for a wain to pass between the beds, without using more land than before for the purpose of trenching.

At this work, two men and two boys should plough a quarter of an acre, with each spell of six cattle, working the same spell each morning for a week, and the same afternoon spell, each afternoon for a week; when the cattle have done their task, they must be turned into a good grass-piece. It is of no use expecting cattle to do the work if they are half starved; they cannot do it: they must have a belly full; and then, with good usage, they will do almost any work. Whilst digressing on the feeding of stock, I beg to call attention to a most nutritious food, which is generally wasted on estates. I mean the refuse from the skimmings after clarifying in the still-house, commonly called the skimming putter-putter; it used to be given to the pigs in old times, but now it is generally wasted; it is a most nourishing food, being all the albuminous part of the cane-juice.

The cattle must not be hurried or flogged when at work, but be taught to pull slow, steady, and all together. There is far more difficulty in teaching the boys to drive properly, and without flogging, than the cattle to draw steadily.

Here, let me recommend the use of the Sub-Soil Plough; it has been used most beneficially at home; in many places, particularly in stiff soils, doubling the produce. The beneficial effect of it is easily explained; the capability of the soil is in proportion to the depth of the staple; a soil with a staple fifteen or eighteen inches deep, must be much more productive than one only eight or ten inches deep, particularly in a hot climate subject to long spells of dry weather; the roots of plants must have twice the room to extend and take in the carbonic acid and ammonia deposited there by the atmosphere and rain; the soil must retain moisture also longer in dry weather, and in wet weather, the sub-soil being porous, the superfluous water will drain quicker away.

I have never practised sub-soil ploughing, but should certainly do so if working on my own account, so convinced am I that the expense would be returned with compound interest.—The operation is very simple, and not expensive: a second Plough follows the heels of the first, but without a Mould-Board, only the coulter and sock being on; it is worked the usual depth of eight or nine inches, and loosens the soil to that depth below the bottom of the furrow formed by the first Plough; but there being no Mould-Board, the sub-soil is not turned up to the surface, the rich soil or staple still remaining on the top. The operation simply loosens the soil to a greater depth, and by allowing the atmosphere and rain freely to penetrate it, it is, in time, converted into a soil similar to the staple. It becomes impregnated with the carbonic acid and ammonia of the atmosphere, and rain, and the excrements of the plants deposited in it, and the dead roots in it, are converted into humus; at the same time one of the most beneficial results from it must be the causing a large portion of the alkalies necessary for ensuing crops to be disintegrated from the soil. It appears, therefore, in every point of view to be a most beneficial operation.

The expense will not be greater than a common ploughing, but eight or ten cattle will probably be required. By commencing immediately after the first Plough, the soil at the side of the bed next the middle trench that is to be filled up, will be loosened by the Sub-soil Plough to the same depth as the trench, so that there will be no lodgment of water in the trench, which there may be if the land be not sub-ploughed.

After the first ploughing is completed, the land should lie a week, and then get a good harrowing. The harrows should be made of heavy wood, and with iron teeth; these are better than harrows made of iron, for the teeth are imbedded three or four inches deep in the wood, whereas in the iron harrow, the substance holding them is scarcely more than half an inch, and the leverage being so much greater in the iron harrow, the contact with large clods, or roots, bends the iron cross-bars. A fall of rain will greatly facilitate the operation of harrowing. It will require as many cattle for the harrow as for the Plough, as the strain is jerking and irregular, and fatigues the cattle fully as much as the ploughing. The people should harrow well an acre a-day. The harrowing should be continued till the soil is well pulverised. In some soils, and in favorable weather, two acres, or even more, may be well harrowed.

A second ploughing and a second harrowing take place in the same way, after the ground has consolidated a little, and after the grass, &c. ploughed in have had time to rot, say in three or four weeks after the first ploughing. This last ploughing and harrowing only are to be charged to the system of cultivation, the first ploughing being to alter the laying out of the land, and for the permanent benefit of the estate.

The land is now ready for making the Cane-holes. The object of all parties seems to be to make the ploughed holes exactly like the dug ones, with a wide space at the bottom and a high bank at the side, like a ditch. This is generally accomplished by going once up and once down with the single Plough, and then cleaning the hole out, or enlarging it, with a Double-Mould-Board Plough. The practice is quite absurd. Nothing more is required than a simple furrow with the single Plough. There is no bank required. If the soil is pulverised, the Cane-roots will run into it in all directions. In the old-fashioned dug Cane-hole, the only pulverised soil was what was on the bank, all the rest of the soil was hard and impenetrable, or nearly so to the roots, it was therefore a great object to get a large bank of pulverised soil; but where the whole soil is pulverised what can be the use of the bank? In making the Cane-hole therefore on my plan, not more than one-third of the cost of the usually ploughed Cane-hole will be incurred. Three acres a day ought to be done, equal to a cost of two shillings an acre. I shall prove further on, from the manner in which the Cane grows, that it does not require moulding, and therefore no bank. There is another objection to the high bank; you cannot, on account of it, plough between the young canes, otherwise the bank would be thrown down, and the young plant buried.

The distance between the rows should not be less than six feet on any land. A less distance will not allow for proper tillage between the canes, neither will it allow them space enough to come to maturity. Our object is to plant the cane at such a distance, and get such a growth as will cause it to thrive luxuriantly for years, and to give as large a return, or nearly so, as at first. We ought to follow the plan of treating the cane as an orchard cultivation, and plant the canes at such a competent distance, like the young fruit tree, as will permit inter tillage and insure crops for years. In the common process of planting, the whole object seems to be to obtain an enormous return from the plant, and to take any thing that can be got from the rattoon afterwards, thus throwing the whole dependance on the plant, whilst by our plan, we depend on the rattoons as much or more than on the plants.

Cobbett, in his work on the cultivation of the Dwarf Indian Corn, or Cobbett Corn, says, "You may, with great care, plough clearly and deeply in the space of four feet, but you can do it a great deal better, and with more facility in a space of five." If a space of five feet be requisite for the cultivation of Dwarf Corn, surely six feet is not too much for such a luxuriant plant as the Cane. The space to be ploughed in Cane cultivation of six feet rows will not be greater than in the cultivation of five feet rows of corn, as the cane-stools grow from a foot to eighteen inches diameter in good soil.

We shall treat of the proper distances of planting again by-and-bye, enough has been said at present to shew the object of making the furrows six feet apart.

The furrows are to be made longways of the bed. The trenches on each side will be an excellent guide, in making the rows straight, and there will be the same number of rows on each side.

From my own experience I should never form Cane-holes nearer than six feet in ploughed land. It does not give room for deep ploughing between them in rattoons at a less distance. Some Canes that I planted in ordinary land, not manured, but the grass burned off, and the land once ploughed and once harrowed, previous to making the Cane-hole, covered the ground so completely that not being able to take them off exactly at the right time a great part of them rotted; and yet the rows were six feet apart, and single tops planted every four feet or thereabouts: the canes were Mont-Blanc, blue, or violet, as differently denominated. One of my neighbours, who is one of the best planters I know, Mr. P., tells me that he finds the ordinary width of cane-holes, four and a half feet, is quite too close for ploughed land, and that he will not plough any nearer than six feet for the future. Mr. M. also, who is a most intelligent planter, and as successful a one as any in the island, and who has had good experience in the use of the plough, agrees exactly in the same opinion, especially when the subsequent cultivation is intended to be done with implements.

In contradistinction to my plan, see the East-Indian system of close planting, and the result, as taken from the evidence adduced before the East-India Company in 1822.

At Radnagore, 30,000 tops are used to plant an acre, the canes being planted 1½ to 2 feet distant, and the tops two or three together: the produce is estimated at 12½ cwt. per acre.

Rungpoor.—" The husbandman begins to prepare his land for the reception of the plants by ploughing it frequently. He then works it again by frequent ploughing. He next manures it with such dung or muck as he may have been able to collect from the cattle, &c., and Ploughs again to incorporate it well with the soil.—In January the ploughing is repeated, and in February, when the plants are ready, it is ploughed up into trenches or furrows, about a haut, or one foot and a half from the other. One bigah of land (one third of an acre) will require about 9,000 plants (27,000 per acre), more or less. each plant being a foot in length; and being laid flat in the trenches, at the distance of about three or four inches one from the other. Each plant will put out three or four shoots: generally one shoot from each joint in the plant, though not more than one or two of these shoots ever arrive at a proper or full growth. The usual height of the canes is from eight to seven feet in good ground, though many canes in every field will not exceed two or three feet. One bigah, supposing the soil and season favorable, is computed to produce from 15 to 20 maunds of goor (or about 6 to 9 cwt. of sugar per acre.) The canes being cut, the land is again worked, and moong is sowed."

In most parts of the East, the people do not seem aware that the Cane will rattoon: some of the East-India Company's servants recommending it to be tried by the natives.*

Santipoor.—Land ploughed eight to ten times. 25,000 tops per acre. Canes trashed. Produce ten or twelve maunds of goor (5 to 6 cwt. of sugar.)

Soonamooky.—Land ploughed four times. Cane holes 2½ feet apart, and the tops placed 2 to 2½ feet apart (9 to 10,000 per acre.) Canes not trashed. Produce twenty-eight maunds goor (14¾ cwt. Sugar.)

Malda.—Twelve ploughings: Furrows half a cubit (10 inches) apart. Plants four fingers' distance from each other. The tops are ¾ cubit, or 15 inches long, so that there is one top every ten inches by 20, or 31,000 per acre. " The quantity of canes produced per bigah is estimated at 8,000," (or 24,000 per acre), less than one cane for each top planted. Produce 6 cwt. of sugar per acre.

REPORT OF THE EAST-INDIA COMMITTEE.

"Land frequently ploughed and manured. Ridges four inches high, and in some districts 1½ feet, in others 2½ feet apart.— The plants three or four inches from each other. Plant-tops generally from a foot to eighteen inches long, and contain several joints, from each of which a shoot arises; but seldom more than *one or two* arrive at a proper growth."

Now, does not such a system of close planting appear to be injurious? Does it not appear that the more tops planted, the less the produce? And have not we followed too much the same plan? I hope I have said enough to draw the attention of intelligent people to the point. I don't wish them rashly to adopt a new practice, but whilst they continue the old system for a time, let them at the the same time give the proposed plan a fair trial on a small scale.

In the Northern districts of the East-Indies the system pursued is better, and the result more favorable. Dr. Roxburgh states— The land is repeatedly ploughed. No furrow is made, but "the labourers with baskets of the cuttings, of one or two joints each, arrange themselves along one side of the field.—They walk side by side, in as straight a line as their eye and judgment enables them, dropping the sets at the distance of about eighteen inches asunder in the rows, and about four feet row from row, (7500 tops per acre). Other labourers follow, and with the foot press the set about two inches, into the soft mud-like soil; which, with a sweep or two with the sole of the foot, they most easily and readily cover. There are generally from three to six canes from each set." The canes, instead of being trashed, have the trash tied carefully round them. "Tying the leaves so carefully round every part of the canes, they say, prevents them from cracking or splitting by the heat of the sun, helps to render the juice *richer*, and prevents their branching out round the sides. The height of the canes standing in the field, will be from eight or ten feet (foliage included), and the naked cane from an inch to an inch and a quarter in diameter. The half vissum (or one acre) of Sugar-cane, in a tolerably season, yields about ten candy of the above-mentioned sugar, or rather more if made into jaggery. Each candy is 500lbs., (5000 sugar per acre, the largest return I find recorded in the East). The planters in these parts very rarely take a second crop. I never could learn that any one had ever depended on a third crop." The return in this district being larger than in others, appears to be from the wider planting, as the cultivation in other respects appears nearly similar to those above mentioned.

Dr. Roxburgh's remark, in summing up his account, is so interesting that, although not strictly applicable here, but rather in the part where I contend against the old-fashioned cane-hole, I will insert it here. "If the Sugar-cane can be cultivated with so much ease, and to such perfection in this climate, (which is considerably hotter than the West Indies), by simply burying the set about two inches deep in the level ploughed field, by which practice the superficial or horizontal roots must be near the surface, of course subject to great heats ; I say, if this practice succeeds so well here, it may be presumed it would succeed equally well, if not better, in the West-Indies, where the heats are never so great, and of course the superficial roots less subject to be scorched. The present practice of digging large square holes to put the sets in, is, I am told, exceedingly laborious, and does not stand the planter in less than £10 per acre, which is nearly double the whole expense of cultivating, from first to last, an acre of canes, and manufacturing the sugar in this district,'

Another instance of wide planting and increased return is given by Buchanan, in his journey through Mysore. Land is ploughed four times. "Then, at the distance of 3 or 3½ cubits (from 5 to 6 feet) are drawn over the whole field furrows, which cross each other at right angles. In the planting season two cuttings of the cane, each containing two eyes, are laid down at every intersection of the furrows," (3000 tops per acre, instead of 30,000.) After sundry waterings, &c., "the intervals are ploughed longways and crossways. The bunch springing from the two cuttings planted at each intersection contains from eight to twenty canes," (instead of one cane from each top planted as mentioned before.)—He says also, "the canes must be carefully bound round with the leaves, so as to exclude the light, else the rind will be thick, and the quantity of the juice very small."

Edwards, in his History of the West-Indies, says, two tops are sufficient for each square hole, but the general practice is now, though I conceive erroneously, to plant much thicker. I have often seen six or eight tops to each hole. But if two were sufficient for a dug cane hole, one would be plenty for a ploughed hole.

ON MANURE.

Of manure, according to the common acceptation of the word, that is, a mixture of animal and vegetable matter in a state of decay, I propose to do away the application.

Animal manure I shall show is injurious. Vegetable matter alone is the proper manure for canes. Of vegetable matter there is generally a sufficiency in the soil, or, if not, the quantity may be increased to almost any extent during the course of cultivation.—And herein lies one of the greatest advantages of the system I propose, that the land can be annually enriched without any expence in the application of the manure used, beyond the simple expence of cultivation pursued.

From a careful perusal of the subject of humus in Liebig's work, and from the consideration of the real nature of the food of plants, and the manner in which they are nourished, I think every unprejudiced reader must have arrived at the same conclusion as myself, namely, that the application of solid manure (that is the black decomposing matter in a dunghill, impregnated with urine), is unnecessary in the cultivation of the cane, and that liquid manure is highly injurious.

Whilst on the subject of manure, it will be well to call the attention of the reader to the difference between the objects of British and West-India cultivation. The object of British agriculture is to obtain the greatest quantity of nitrogen both as seed in their corn crops, and also in the leaves of their green crops, which are for the same purpose for the food of man and animals, as it has been demonstrated that food is nutritious just in proportion to the quantity of nitrogen contained in it. The object of our agriculture, on the other hand, is to have the smallest quantity of nitrogen consistent with the constitution of the vegetable structure of the cane, but a large excess of carbon, in proportion to the nitrogen, as then the surplus has been demonstrated by Liebig to go to the deposit of Sugar in the cellular tissue. It is well known that Sugar is simply carbon combined with the elements of water, so that it will be easily conceived that the surplus carbon will be converted into Sugar.

A soil rich in decaying vegetable matter will always extract sufficient nitrogen from the atmosphere necessary for the perfect developement of a green crop like the cane, although not sufficient for a corn or seed bearing crop.

Whilst on this subject I must beg the reader to refer again to that part of Liebig, where the effect of animal manure is exhibited on beet root and potatoes, the two crops most nearly approaching to the Sugar cane. It will be found that liquid manure is injurious to both, and that the quality of beet-root Sugar is the best when grown on barren sands. See also the injurious effects of animal manure in the boiling of beet-root Sugar, showing that the juice that would otherwise make Sugar, becomes converted into molasses, an effect which we often experience in boiling the juice of manured plants. The starch of the potatoe, and the sugar of the sugar cane, are both formed in a similar manner, in fact so little difference exists between the two products, that by a very simple chemical operation pure starch is converted into pure sugar. The argument therefore against the use of manure for the beet-root and potatoe apply with equal force to the cane.

The chief use of solid animal manures is their returning to the soil the inorganic constituents of plants derived from the soil. We have the power of returning all these matters to the soil in a much simpler and cheaper way, namely, in the shape of ashes from the stoke-hole or the still-house.

The application of ashes supersedes also the use of bone-dust, which is a means of returning to the soil the phosphates carried away.

But the reason why the solid animal manures are not advisable as manure for canes is from their being impregnated with urine.

Liquid animal manure, being rich in nitrogen, makes the cane rank and luxuriant, but not saccharine. Sugar contains no nitrogen, but molasses does; liquid manure therefore forms molasses at the expense of the Sugar. It is, well known that canes, heavily manured, will scarcely make sugar, but yield abundance of molasses on boiling.

A small portion only of humus is required for the young plant, and that is already in sufficient quantity in the soil without any further application of vegetable matter. It is, previous to the ploughing, in a state unfit for the food of the young plant, but ploughing converts the noxious particles, the excrements, into nutritious food. If the land has been in canes previously, or if in pasture, besides the trash or grass on the surface, which may be ploughed in, and which will become humus in a very short space of time, there are all the roots and excrements under the surface of the soil, which, during the operation of the plough, are oxygenated and converted into a mass of vegetable matter in the state of decay, and therefore giving out carbonic acid for the nourishment of the young plant.—This will be sufficient nutriment for the young plant until it puts forth its leaves freely to the atmosphere, after which period the plant absorbs its nourishment from the atmosphere, and the humus in the soil becomes no longer essential to its existence. The only apparent beneficial action of the humus in the soil, after the plant arrives at this stage of its growth, is the effect it has in keeping the soil perfectly porous, so that the atmosphere can penetrate freely.

This explanation of the phenomena of the growth of young plants will explain a fact positively stated by Tull and Cobbett, that the sowing of seed and transplanting of plants should take place "close upon the heels of the plough," as Cobbett says, "whilst there is a fermentation in the soil," the cause of it he leaves to others to elucidate, satisfied with the results he has seen to attend its practice; but he insists upon it as being "prodigiously advantageous." The above explanation shows that the practice is founded on true principles.

Some parties may, however, insist upon the application of manure, and some soils may not be rich enough without it, and it may be taken as a general rule that the drier the district the richer the soil should be artificially made, as Sir H. Davy proves that soils imbibe dew in proportion to their richness in organic matter. Besides nourishing the young plant it has a beneficial action on the soil mechanically, keeping it from binding. The state of the grasses, bushes, or weeds growing on the land, are a sure index of the state of fertility or barrenness of the soil; if they grow luxuriantly, which is usually the case, no manure is required; if, on the other hand, they are stunted, and shabby, vegetable matter is deficient in the soil, and should be supplied. If manure can be applied with facility, it may be done; but if there is a difficulty or embarrassment on account of the expense, it must not be forgotton that, by the use of the plough, we may annually make the land richer and richer on the principle of the application of the green crops that are ploughed into the soil as manure in Britain, by ploughing the field trash into the soil each year after cutting the canes. My advice would be, in the case of there being a difficulty in getting or applying the manure, to plant the land in canes, and to enrich the soil during the cultivation of the cane as indicated above.

If it be determined to apply manure, the simplest and cheapest method is by the folding of cattle, or fly-penning, as called here.—By this method all the liquid manure is applied to the soil. Now, it has been proved that liquid manure is very rich in nitrogen, which encourages the growth of the cane excessively, but injures the quality of the produce, and does not allow the saccharine matter to be deposited in proportion to the luxuriance. The remedy, in this case, is the cultivation of a corn crop, as commonly practised when canes are planted, but which practice has been improperly adopted in all cases, parties not being aware of the difference of the circumstances. The nitrogen from the liquid manure goes to form the seed of the corn, and there is always a large crop of it where the land is well penned. I believe I may claim the honor of having been the first to elucidate the effect of the corn crop on the cane. An estate for which I am concerned fell off in the crop largely from the estimate, the cause I could not find out; the canes were beautifully luxuriant, and, although estimated very low for the district, did not make above two thirds of the estimate. I considered the matter over and over. but could make nothing of it ; a study of Liebig, however, elucidated the matter ; the land had all been fly-penned, and no corn had been planted, the result was as above stated. If corn had been planted, the cane would have been far less luxuriant, and therefore the estimate would have been made in proportion to the appearance, and without deception. Since then I have conversed with my neighbours on the subject, to whom the explanation was quite new, and they then recollected several instances confirmatory of my views.

Report on East Indian Sugar.—" The land is carefully watered, and in some places is allowed a little manure, but in others it is alleged, that, if manured, the cane, although it grows more luxuriantly, gives a poor juice, that is not fit for yielding extract."

Whilst treating of manure it will be expected that I should enter into a consideration of those manures which are now attracting, and deservedly, so much attention ; namely, guano, bone-dust, charcoal, and the different ammoniacal salts. They are essentially manures suitable for corn crops, for increasing the quantity of nitrogen in plants, and as such, except in the dry districts of the island, such as Vere and Liguanea, they are likely to prove more injurious than beneficial; they will increase the growth of the vegetable part without adding to the saccharine development. They will also increase the quantity of molasses formed by the addition of nitrogen to the cane juice ; they will tend to make the cane over-luxuriant and rot, as is constantly found to be the case in land heavily fly-penned.

I conceive the cultivation of the cane to be essentially forest or orchard cultivation, in opposition to the system of corn and vegetable food cultivation ; in the latter crops the azotised matter is wished to be increased as much as possible, to increase the nutritive power; in the former, the carbonaceous part and the saccharine part (which is essentially carbonaceous,) are the objects to be encouraged : the two methods are, therefore, diametrically opposite. On the other hand, for our other staple, coffee, as it contains a large quantity of nitrogen in the berry, all the manures suitable for increasing the quantity and nutritive power of corn crops, are the proper manures, the object being to increase the quantity of azotised matter. And for this purpose charcoal stands pre-eminently high, and may be had in inexhaustible quantities at a small cost.

In laying down what I conceive to be the general principles of the application of manures, I do it with some diffidence, as they have not yet been sufficiently tried in the cultivation of the cane, but such appears to me the general rule of their application. In dry districts and poor land, a moderate application of them may be found beneficial, and of all those named above I should incline to the use of charcoal. Liebig states—"That powdered charcoal surpasses all other substances in the power which it possesses of condensing ammonia within its pores, particularly when it has been heated to redness. Charcoal absorbs ninety times its volume of ammoniacal gas, which may again be separated by simple moistening it with water." Now, in our case, the question is whether it would not absorb too much ammonia; parties must judge for themselves, according to the nature of their soil and climate, the poorer the soil and the drier the district, the more might be applied. It is the cheapest of all the manures mentioned above, and therefore deserving of a fair trial. Liebig, in another part of his admirable work, says, "It must not, however, be left unnoticed, that common wood charcoal, by virtue merely of its ordinary well known properties, can completely replace vegetable mould or *humus*. It is known to possess the power of condensing gases, within its pores, and particularly carbonic acid. And it is by virtue of this power that the roots of plants are supplied in charcoal exactly as in humus, with an atmosphere of carbonic acid and air, which is renewed as quickly as it is abstracted." In this view of the case, it would appear to be highly beneficial in the cultivation of the cane. At any rate, I think enough has been said to induce parties to give it a fair trial. In treating of rattoon cultivation, I shall have to recur to this subject again.

In treating of manures, it is necessary to investigate the benefits to be derived from the use of a summer fallow, as it is a common means of enriching the soil, although perhaps not exactly to be called manuring. One great use of it is to disintegrate fresh alkalies from the soil, to supply the place of those carried away in the crops. The next great use is to convert the roots of the previous crops and the excrementitions matters deposited there by the previous crop into nutritive matter, by exposing them to the oxygen of the atmosphere, which soon causes them to enter into a state of decay, and makes them furnish wholesome food for the succeeding crop. But, perhaps, the chief benefit consists in putting the soil into such a state of fine tilth as allows the roots of the succeeding crop, to strike freely in all directions, and at the same time making it perfectly porous and permeable to the beneficial action of the atmosphere.

These are great advantages, and I propose to take advantage of them, not only in the preparation of land for canes, but also annually, during the subsequent course of cultivation proposed for rattoons.

Lime is generally considered in the light of a manure. It hastens the decay of vegetable matter. I do not think it necessary to be applied to the cane. Most soils contain lime in sufficient quantity for the purposes of vegetation. All soils that have once grown good canes can be made to grow them again, and without the assistance of lime.

Saving effected by the non-application of manure.—Cobbett says, speaking of the difference in expense between the Tullian system of constant ploughing without manure, and the expense of the dung cart, with its previous and subsequent consequences,—"you will soon find that a bright ploughshare is the cheapest commodity ever used by a farmer."

Penning of cattle at night half-fed and often in the rain, in addition to hard work in the day, is the chief cause of the decrease of cattle where penning is constantly adopted. The mortality by consumption, more properly speaking *non-consumption*, or starving in a wet pen at night, I should calculate not less than 10 per cent. of the stock annually. To speak quite within bounds, say it is only five per cent. saved by not penning; but by turning the cattle out into a close pasture at night they get a belly full of food, or at least a dry place to sleep in, and are ready for a hard day's work on the morrow. This is the more requisite now-a-days, for on many estates the wainmen do not spell the cattle at midday.

PLANTING.

In the chapter on the preparation of the soil we have decided on the adoption of six feet rows of the cane; we have now to decide on the distance at which the canes should be planted along the row. My opinion is a single top every two feet for Bourbon, and every three feet for Montblanc or violet cane; the Bourbon cane not stooling so freely as the other. They should certainly not be nearer than that; I shall plant even further apart, but as Cobbett says of the English Farmers, "if they were to see the Yankee ploughing between his full-grown corn, it would frighten them out of their wits." I am afraid I shall have placed my readers in a similar predicament, and yet nothing can be more necessary than that the cane should be thinly planted. The common practice of thick planting is totally wrong, as I hope to be able to convince my readers before I have done. They will scarcely believe me when I inform them that for every top they plant in their thick method, they do not get more than two or three canes, and they may satisfy themselves of the fact by reckoning the number of tops usually planted, and the number of canes growing on one chain, or the tenth part of an acre, reckoned when eight or nine months old, before the canes lodge, and at the time after which they usually pull out all the suckers. I expected to have been able to publish the results of calculations made on several estates, but press of business has prevented it. The result in the East-Indies, as given before, will not be forgotton however.

I object to two tops being planted together, as every top planted will grow, and the stool from the united growth of the two tops will not be larger than the stool from one top ; the one top will have as much nourishment as the two, and the stool has an inexhaustible supply of eyes ready to throw up as many canes as the land can maintain. But if the united stool from the two tops be no larger than the stool from the one top, each part of it will be only half the vigour necessary for sending roots deep into the soil to extract moisture in dry weather, and for searching for food in the soil. It will therefore, in the end, not prove so luxuriant as the single top planted.

In October last I planted some cane tops, of four eyes each, without manure, in the garden, for experimental purposes. Several have now upwards of twenty young sugar-canes, after pulling away a good many sprouts that would not come to perfection. The canes have not yet been banked. When the May rains set in, they will throw out another growth of canes, probably twenty more, which will come to maturity by the end of the year. They have had no cultivation, except common hoeing.

It will scarcely be contended that a plant top, giving only two or three canes, can have the same ramification of roots, and the same vigour and ability to throw up a rattoon as canes thinly planted, and which have borne twenty or thirty canes, and must therefore have had an extensive system of roots running both wide and deep to supply them with moisture and food.

Where the object is only a plant-cane, as in the East-Indies, or where it is the chief object, as it generally is here, the plan of thick planting is less injurious, as one cane comes to maturity from each eye planted, no suckers or second growth of canes is allowed, and all the first growth come to maturity together. But in the system of cultivating rattoons, and depending on them for the crop, can such a method of planting be advantageous ? The falling off of the quantity of sugar, in rattoons in this country, when the cane is thickly planted, and the getting no rattoon at all in the East-Indies, when the thick planting is carried to the greatest extreme, show that it is an incorrect practice.

But taking it for granted that it has been ascertained, by long experience, that the quantity of tops usually planted in land dug with the hoe is correct, it follows that the same number of tops for ploughed land would be vastly too much. In the dug cane-hole not more than half the surface or half the depth of the soil is pulverized in comparison with ploughed land, therefore it would take four times the number of plant tops to throw up as many canes as the same quantity of ploughed land would give: it stands to reason therefore that one fourth the number of tops, in ploughed land, will suffice to yield the same quantity of sugar. But I think I have shown that the dug cane-holes were too thickly planted to continue to yield well in rattoons, for the same reason one-fourth the number of tops will overplant ploughed land, not if the object be to get a larger return from the plant canes, at the expense of the rattoons, but certainly if we want only, comparatively, a moderate return in plants, but to continue the same amount annually in rattoons.

The practice of thick planting has originated from the idea which nobody seems to have taken the trouble to investigate, that the cane has only a very short root. Porter, on the sugar-cane, a standard work for the guidance of young planters, says, "The roots are very slender and almost cylindrical; they are never more than a foot in length; a few short fibres appear at their extremities." I have often discussed the matter with Planters, but never found more than one or two who would allow that the cane had much more than what Porter mentions. Consider the matter—how is it possible for such a small root to maintain such a large plant? Why should the cane be an exception to the general rule that the roots of a plant or tree extend as far below ground, and all around, as the branches and leaves do above? Tull, the father of the horse-hoeing Husbandry, proves that the lateral roots of a turnip spread upwards of three feet each side, although on pulling it out of the ground, you would hardly suppose they were three inches long. In digging post-holes for a cow-pen on a thrown up cane-piece, I have found abundance of strong cane roots, running in all directions, in a stiff cold clay, two feet perpendicular below the surface. In transplanting some young canes, about six or eight weeks old, I pulled up some with roots fully three feet long; they must have been much longer, but the fine ends were broken off by being roughly pulled out of the ground. On mentioning the above circumstances to a friend of mine, he told me that, in confirmation of the circumstances, on one occasion when travelling, he passed a part of a steep bank that had lately fallen from wet weather, and that he could distinctly trace the cane roots ten feet deep. Of this I do not entertain the smallest doubt, as it isquite in accordance with vegetable physiology.

In confirmation of the correctness of the wide rows recommended, let any body examine an old cane-piece attentively, and they will find the cane naturally thins itself out; the more luxuriant canes rob the weaker ones of their nourishment till they destroy them; and if an attempt is made to supply the piece with the expectation of having as many cane roots on it as in plants, the labour will be found in vain; no supply cane will thrive unless the space is from six to eight feet each way. Wherever an extraordinary luxuriant cane stool is found, the alternate cane-row will be found to be dead, and no cane will be found growing within six or eight feet. This is from facts observed in hard unploughed land.

I think I have now said enough to induce parties to make a trial of thin planting. The next thing to be considered is the way in which the cane is planted. The land from the preparation adopted, is in a beautiful state of fineness. The man is to take as many tops as he can conveniently carry, ready trimmed, and dropping one every two, or three, or four feet, as may be determined upon, and according to the kind of cane, press it slightly into the soft earth by putting his foot upon it. It is unnecessary to cover the top, in fact it is preferable for him not to do so, as tops are much oftener destroyed by being too deeply buried than too lightly.—Scarcely a sprout will find its way up if buried two inches deep, which I ascertained accidentally in my garden. Having planted some canes by way of experiment, heavy rain came at night, and washed the earth upon them two inches deep; after a few days, finding them not coming up, I searched for the sprouts, and found them curling about in the ground, in vain endeavouring to force their way up.

There is another reason for not covering the tops. It is a most difficult thing to get the labourers to plant them thin, and although you bargain with them specially to do so, and pay them high for the purpose, the force of old habit prevails, and when your back is turned they plant double allowance.—I had the greatest difficulty in getting it done to my liking, although I employed the people I could place most dependence on—such was the force of old habit: afterwards, however, when they saw the luxuriance of the canes, they acknowledged I was right. The cane will take root immediately it is planted, although it is not covered. I therefore recommend them not to be covered at the time of planting. "Dead men tell no tales;" if the tops are buried, you have no security as to the distances at which they are planted, and when they grow, you have the mortification of finding your orders have been set at nought. After a few days, when the cane begins to grow, a person may be employed to cover them over lightly, but without the weather is dry it is unnecessary.

One man, in this manner, will plant fully half an acre a day: he will also cover the tops at the rate of an acre a day, so that the planting costs six shillings an acre I got some of my canes planted by the job at a dollar an acre, the man, after placing the top, covering it with mould thrown on by his foot, which is easily done from the pulverised state of the soil.—Now, in the usual process of planting, four times, even in ploughed land, oftener six times the number of tops have to be picked, carted, and planted; so that, at least, three-fourths of the usual expense is saved, but to be on the safe side, say half.

I omitted to mention the top is dropped longways in the drill, and as some people are very particular as to the turning the heads and tails of the tops, it is as well to state that it is immaterial which way they turn; the only thing of consequence is, that the top should be placed with the eyes on each side, and not one up and the other buried, as in that case the bottom set of eyes will not grow; this is another reason why the tops should not be covered until inspected.

The planting should take place, as Cobbett says, immediately after the forming of the furrow. These are his words: "This work (transplanting) should be done in *dry* weather, if possible, and should *follow closely upon the heels of the plough.* This is a thing prodigiously advantageous to the plants; for a fermentation takes place in the earth at every moving, and here this fermentation comes to the aid of the plant, which has a root ready formed to be operated upon, and which strikes off immediately." Although he only speaks of transplanting, the same reasoning applies to planting.

The Cane tops used for planting should be of the most healthy and luxuriant canes, "like produces like," and if the tops are good, the canes will be good also. As so few are planted, great care should be taken in the selection of them, and they should be planted as fresh as possible.

The change of tops, on a similar plan to the change of seed in England, is well worthy of consideration. The plant top is a bulky article, and it could not be carried in large quantities any great distance, but it might be tried on a small scale. An intelligent gentleman informed me that he tried it once, and found the result most satisfactory: he planted a cane-piece, half with tops from his own land, and half with tops from a neighbouring estate; the canes from the latter half were, he said, far more luxuriant than the others.

As the planting is immediately to succeed the ploughing, and as we never plough in wet weather, it follows, as a matter of course, that we plant in dry weather. Such I recommend to be done; every top will grow, such nourishment do they receive in the newly ploughed soil. I planted two cane-pieces at the same time, one ploughed, the other dug; it was in dry weather; every top grew in the ploughed land, but the other piece, though thickly planted in the old way, had to be nearly re-planted.

Having gone through the planting of the cane, I must now allude to the common practice of planting corn along with it. I before mentioned that if the land is heavily fly-penned, it is beneficial to take a crop of corn off for the benefit of the cane, but it is also necessary to consider the case of land not manured. It is a matter of much interest to decide the case whether a corn crop be injurious, and to what extent. Besides the interests of the absentee proprietor, there is rising up a new class of residents in this country who are interested in the matter, I mean those renting estates.

By my system of cultivation the land will not be fallowed more than once in eight or ten years so that there is a great length of time fore the necessary alkalies to accumulate. I am therefore of opinion that a moderate crop of corn may be taken off without much injury to the cane. It must, however, never be repeated in the rattoons. The crop of corn, except in the case of land fly-penned, is not likely to be heavy, although no corn crop has been taken off for the ten previous years; it is not likely, therefore, to be perceptibly injurious to the cane. The idea of corn being beneficial to the young cane, by shading it, is too absurd to be worthy of refutation.

The corn must be planted in the bottom of the drill between each top, and not on the bank as commonly practised, where it would interfere with the operation of the hoe-plough and horse hoe. It should be planted the day after the cane, else from the rapid growth of the cane it will be over-shadowed before the seed ripens This is still another reason why the cane should not be covered, else the situation for planting the corn would not be observable.

CULTIVATION.

About three weeks or a month after planting, the young canes will want weeding. The drill itself must be cleaned by manual labour, and as the drill will not be more than one foot wide, there will be five feet left to be cleaned by agricultural implements.— As the land was well freed from weeds by the preparatory ploughing and harrowing, the labour will be very light. Some canes that I planted in land ploughed only once, and harrowed once previous to making the drill, I got cleaned by contract, at about a month old, at a dollar an acre; having no instrument for cleaning the canes, the man had the whole to hoe, but the weather having been dry there was little to be done. As I propose now to clean three quarters of the surface by cattle power, a man may surely be reckoned to weed the young canes at the rate of an acre a day, or two shillings an acre, The young canes are not to be moulded at this time.

In all my calculations I shall consider that the work is given out by job work, and at such a rate that an ordinary working man may be enabled to earn at the rate of half a-dollar for a fair day's work. Another matter must also be mentioned. I always endeavour to commence cleaning the canes before they are usually considered to require cleaning; I thus keep a-head of the work, and am enabled to get it done at what are considered very cheap rates. It is by far the cheapest method in the long run, and it must be allowed that it is more beneficial to the plant to have two cleaniugs at a dollar, than one at two dollars. I think it necessary to state these particulars that the correctness of the prices stated may not be doubted.

The drill having been weeded by manual labour, the horse-hoe must be brought into operation.

There are several descriptions of horse-hoe which are likely to be beneficially employed; those with flat hoes, as Wilkie's and Eddie's, are well suited for light soils, but will be apt, I am afraid, to clog in stiff soils: Agricola's, made after the plan of Kirkwood's grubber, with vertical teeth, is likely to be better suited for stiff soils, and perhaps will be equally beneficial with the others in light soils. Further trials are requisite to decide the relative merits of them, however. The latter horse-hoe has a pair of wheels attached —by means of which, and depressing the handles, the teeth may be raised out of the ground at the end of a row to enable the machine to be turned round.

Whichever hoe is used, it is a matter of little consequence: they are all made for working with one horse or two cattle—those with flat hoes will do the work more superficially, and those with harrow teeth or coulters, will go deeper. If there is no horse-hoe, the little hoe-plough will do equally well, in fact better, as the work is deeper, although of course, the operation proceeds more slowly, as only one furrow can be taken at a time.

This hoe-plough is a miniature plough of the Wilkie construction, and made by that person; it is intended to be worked by one horse. I believe I may claim the merit of having been the first to introduce it into the island, having imported it and worked it in the year 1841. It is likely to be more generally useful for agricultural purposes than any other implement, except the large plough. The cost of it is about four pounds, besides freight and charges. I have worked it with one horse in hard soil, I mean land not previously ploughed, although the horse was not corn fed at the time, and was not accustomed to draught. It is made to go about five or six inches deep. The horse being my private property I usually worked the hoe plough with two cattle yoked abreast. All the land operated on was the hard soil between rattoons, not having any youg plants at the time. Two cattle were worked in the morning and two in the afternoon, and each spell ploughed a quarter of an acre of hard soil in the manner of close ploughing between rattoons. A man and two boys were employed, the man at half a dollar, a stout lad driving at one shilling and three pence, and a little one leading at nine pence, so that the close ploughing between the rattoons cost two dollars an acre.

In ploughing between the young plants, however, one steer or horse must only be used, and that in harness; or two cattle in harness, one before the other—the two walking abreast, when the side of the row was being ploughed, would tread on the young sprouts, The land having been previously well pulverized, one steer would be quite capable of doing the work, and ought to do an acre a day, being spelled in the middle of the day. Say the operation costs six shillings an acre.

The plough is to begin in the centre, between the two rows of canes, and throw the earth towards the middle of the row, and away from the young cane, the cane at that period being much too young for moulding.

If a horse-hoe is used the two cattle may work abreast, as they will not tread, if carefully guided, on the young sprouts. It will be necessary for them to go once up and once down each row, not being able to take the full width at once, and for the purpose of destroying, more effectually, at the second, any weeds escaped at the first turn, besides pulverizing the soil more. They should do two acres a day, and the same three people being employed, the operation will cost about two shillings an acre; I will reckon three shillings.

The wain tracks or trenches, should be cleaned at the same time by the horse-hoe, or by manual labour, but not with the hoe-plough. If the trenches are wet, it will be necessary to hoe them by manual labour; if dry, they should be horse-hoed. The trenches will probably average ten per cent. of the land, and if hoed by manual labour would not be cleaned for less than ten or twelve shillings an acre, and being the tenth part of an acre, would cost one shilling an acre, or for three cleanings, three shillings.

I have reckoned the horse-hoeings at three shillings an acre. Tull reckoned his at only six pence. He continued hoeing till he extirpated all the weeds, as he never allowed them to flower.

I have reckoned three people to be employed with the horse-hoe; after practice, I expect two will be found sufficient, a boy guiding them with a nose-ring, and the ploughman, but we cannot expect to do so at first.

If the Canes have been planted, according to my directions, there will be no supplying required, however dry the weather may have been; no expense, therefore, will be calculated for it.

At two months old the young Canes in the drill must have another hand weeding, and at the same time, the horse-hoe must be again set to work.

Although there should be no weeds, it is necessary to stir the soil, which is exceedingly beneficial to young plants of all kinds. Having previously shown how the act of ploughing is beneficial, I will, in this part, only refer to a practical farmer to show the benefit of tillage between growing plants.

Cobbett, in his work on the Dwarf Indian Corn, says, "The preparation of the soil is of little consequence compared with the proper cultivation of the corn while growing. It is the *after cultivation* upon which the corn planter may, on the Tullian system, place his chief reliance. Good, true, and tolerably deep *ploughing* is the main thing in the cultivation of corn, which, indeed, will not thrive, if the ground be not deeply moved, and very near to the plants too, *while they are growing*," The reasons for this are given by Mr. Tull, but I have seen enough of the experience.— Now, therefore, (when the corn is six or eight inches high) the plough must "begin to move; not only for the destruction of the weeds, but for the furnishing of *fresh soil for the plants*. The interval is five feet wide; the plough begins in the middle of it, and turns three furrows on each side towards the middle of the interval, and going, when ploughing the two last furrows, within *two or three inches of the stems of the plants*, and going a *good depth*. throughout the whole of the work; not, at any rate, less than six or seven inches. At the end of four days, plough the same intervals back towards the plants. If the ground be not very foul, one more ploughing is sufficient; that is to say, one more *double* ploughing, a ploughing from the plants, and another to turn the earth back. At this ploughing you must not go quite so close to the plants as you did before; but if you now leave six inches between the plants and the plough, it will be quite enough, taking care to plough by alternate rows.

"Let no one be afraid of the consequences of thus tearing about the roots of the plants when they are at this advanced age and height. Ninety-nine of my readers out of a hundred; and I dare say, nine hundred and ninety-nine out of a thousand, will shudder at the thought of tearing about in this manner; thinking that breaking off, tearing off, cutting off, the roots of such large plants, just as they are coming into bloom, must be a sort of work of destruction. Let them read the book of Mr. Tull: or let them go and see my friends the Yankees, who generally drive the 'thing off to the last moment.' By-and-bye, however, the Yankee comes with his plough; and it would frighten an English farmer out of his senses to see how he goes on, swearing at the horses, and tearing about the ground, and tumbling it up against the plants; but, at any rate, moving it all pretty deeply, somehow or other. I have seen them do this when the tassel was nearly at its full height, and when the silk was appearing from the ears. One rule is invariable; that is, that if the corn be not ploughed at all there will be no crop—there will be tassel, and the semblance of ears—but (upon ordinary land), there will be no crop at all. If you cut off the root of any herbaceous plant in the summer time, it is like cutting off the shoot off a tree; several roots come out immediately, instead of the one there was before: these bring fresh supplies of food, and the plant flourishes and produces accordingly."

While discussing the cultivation of the cane during its growth, as I have recommended constant ploughing, it will be well to combat the prejudice generally existing as to the propriety of ploughing in dry weather. Most Planters are ready to admit that it would be beneficial in rainy, but few conceive that it would be advantageous in dry weather. Now, I conceive it is more necessary in dry than in wet weather.—In wet weather the constant moisture furnishes food to the plants; in dry weather, ploughing is the means of furnishing food to them. Tull clearly demonstrates that ploughing land in *dry* weather make it *moist*; he says that anybody may satisfy himself of the fact by digging a small patch of land in a hard soil in dry weather and pulverizing it with the spade; he says in a day or two it will be found moist, whilst the undug land remains dry. Cobbet gives an amusing account of the severe test to which he put Tull's theory, by digging his Indian corn piece, near New-York, at mid-summer, and states that the result was perfectly successful. I have before shown how ploughing was the means of furnishing food to plants ; I only wish here to show that the operation should be performed, however dry the weather may be.—The finer the soil is pulverized, the richer and moister it will be.

At three months old the hoe-plough must be employed.—The land is now becoming too solid, and must be deeply loosened. The ploughing commences next to the cane, and the earth is thrown against it, or, as commonly said, it is moulded. The same operation moulds the corn. The cane at three months old is able to bear the mould being thrown against it without injury. This is the only moulding the cane receives. It is simply filling up the drill to make the land level. The hoe-plough continues working up and down the row till the whole receives a good ploughing to the full depth of the Plough. This operation, of course, destroys all the weeds.

At four months, and again at five months, the cane-piece may receive another horse-hoeing, which will be all the cultivation that the cane will require. It will by this time have a most luxuriant growth, and will expel all fears as to non-ability of covering the ground, although so thinly planted originally.

I consider the operation of banking quite useless. In dug cane-holes it was a proper practice, because there was no loose mould except what was on the bank, and it was therefore broken down and spread round the cane for the roots to strike into. But in the ploughed land, in whatever direction the roots strike, they meet with pulverized soil; and therefore the bank is unnecessary.

The growth of the cane appears to be quite misunderstood. Porter gives a representation of the growth of a plant top, exhibiting first a single sprout rising ; then as the cane is moulded, two branches growing out from it, on a further application of earth, these also again branching out. Now, the cane, instead of throwing up the sprouts, as he represented, sends them out laterally in the manner of arrow-root suckers ; they spread out laterally six inches, if the soil is good, and then turn up gradually to the surface, forming a wide stool. If a top is planted in good land, and never covered with more than a single inch in depth of soil, it will send up just as many canes as if it were moulded a foot high. The suckers that some people have such a dread of, and always order to be pulled out when found in a cane-piece, are nothing but the natural growth of the cane, and in six or eight months become splendid suger-canes. A sucker is nothing more than a young cane, and that too of the most vigorous growth; it is the effort of the cane to become a large plant, and extend itself, and should, therefore, in our system, never be checked. We want large vigorous plants. In the common system the suckers are pulled away from an erroneous idea that they rob the other canes of their nourishment, that sugar descends out of the full grown cane to form nourishment for the sucker. Dutrone shows that the saccharine juice is deposited in cells in the stalk of the cane, shaped like the cells in a honey-comb, and that there it remains till the cane is squeezed at the mill, till it goes to flower, or arrow, until the buds grow, or until it goes through the natural process of decay. The idea of it descending is therefore absurd. The more probable reason for pulling out the suckers is, that they will will not arrive at maturity in time for making sugar with the other canes. But even in this view of the case, it must be considered injurious, as preventing the stool from enlarging itself, and becoming luxuriant. I have seen people pulling out the suckers from young canes, and actually leaving nothing behind worth calling canes—regular supple-jacks; I should rather have pulled the supple-jacks, and left the suckers.

As no further labour is bestowed on the canes, of course they are not trashed. The width of the rows; the thin manner in which the cane is planted: the not using animal manure to force on an over luxuriant growth, and which trashing is only the means of remedying, do away with the necessity of the operation altogether. This is another practice proposed, so totally at variance with the usual practice, that it is necessary to investigate the subject fully.

Liebig demonstrates that the sugar is not deposited by the leaf until it arrives at complete maturity. In trashing there are always a number of them pulled off long before they come to maturity—quite in the green state; the sugar therefore in the joint cannot arrive at its proper state, but may be considered to be in the state of molasses or imperfect sugar.—Such in reality is the case, and I have found that when especial care is taken of a piece, by constant trashing, and doing every justice, as the overseer thinks, to it, the produce is much worse in quality than he anticipates. When, on the contrary, the cane has, from want of laborers, or any other cause, been neglected, as supposed, that is not trashed, the canes have made more sugar, and of a better quality than was anticipated.

From my own experience I have quite given up trashing, except in heavy or manured plants. I find also, that upon explaining the nature of the operation, my friends are able to substantiate my theory by their own experience. In the East-Indies, I find, from the work before quoted, that instead of trashing the canes, the leaves are constantly and carefully tied round the canes: the liquor appears from the same authority to be much more saccharine than ours, although the canes are frequently irrigated: this I attribute to the not trashing of them. Sir H. Davy mentions that heat, moisture, and darkness are favorable to the development of the saccharine principle, and instances the case of plants in a hot-house kept dark ; their stalks become white, and the juices very saccharine. It is not probable that this is also the case when the cane is not trashed ? At any rate, of one thing we are sure, that pulling off the leaves before they are withered, which is always done in trashing, prevents the juice in the joint from being perfectly developed.

Bryan Edwards, in his History of Jamaica says : The ancient practice ot trashing rattoons is of late very generally and very justly exploded."

In Demerara, where all the cane cultivated is the Bourbon, the canes are never trashed, because they cannot obtain the requisite labour now-a-days, and the produce is of excellent quality ; but no manure is used.

I am informed also, that in Cuba the canes are not usually trashed.

Canes on manured land, and in rainy weather, should be lightly trashed until they lodge, after which time you might as well turn the cattle in as send the people to trash them.

As I propose not to use any animal manure, I propose not to trash the canes, certainly not the rattoons, but if any parties think it more prudent to trash the plants, let them remember that if they allow any, except the perfectly withered leaves to be pulled off, they injure the quality of the produce.

The trash remaining on rattoon canes, holds the moisture of dew and rain, and makes the canes much more luxuriant than if trashed.

Plant-canes are usually trashed about three times, and at the rate of eight or ten shillings an acre, which amount is saved by my method.

By my system, the plants should be allowed extra age, that the first and second crops of suckers may have time to ripen. I should consider the proper age for cutting them to be from 15 to 18 months old, but much must depend on the time of year, and on the seasons.

I should expect a yielding of, on an average, two tons an acre from the Montblanc, and three tons from the Bourbon cane. I should give a decided preference to the Bourbon. It is commonly considered not to rattoon so well, but, as far as my experience goes, I find no difference in the length of time it rattoons. It will not stand ill usage, or neglect, like the violet, but, if properly cultivated, I see nothing to prevent it from rattooning as well as any other cane; it requires more cultivation, but this is counterbalanced by the greater quantity and finer color of the produce.

In estimating the produce per acre, the amount may be deemed excessive; there have, however, been several cases known in the past year of pieces of Bourbon cane making four hogshead per acre; three hogsheads per acre is a frequent return in Saint Mary's, for plants; and, as the maximum amount of cultivation has been supposed to be given, I do not see why that return should not be obtained.

The object of my system is to have a small field highly cultivated; therefore, I have supposed the maximum amount of cultivation to be given.

In considering the relative merit of the system of cultivation proposed, in comparison with the old system, one benefit, although trifling, should not be overlooked, namely, the utter destruction it will make of rats and other vermin by the constant moving of the soil.

The expense incurred for an acre will be—	£	s.
One close ploughing (the latter close ploughing being for the permanent benefit of the estate, and not essential to the cultivation, not to be reckoned) - - - -	0	12
One subsoil ploughing - -	0	12
One good harrowing - -	0	6
Ploughing the drills, or cane holes -	0	2
Planting - - - -	0	6
Supplying - - -	0	0
First hand-weeding - -	0	2
First horse-hoeing - - -	0	3
Second hand-weeding - -	0	2
Second horse-hoeing - -	0	3
Hoe ploughing and moulding -	0	6
Third and fourth horse-hoeings, at 3s.	0	6
Hoeing the trenches by manual labour, three times, at 1s. - -	0	3
Trashing - - -	0	0
Expense per acre -	£3	3

Expense per ton, supposing a return of two tons per acre, £1 11s. 6d. ; at three tons per acre, of £1 1s.

RATTOON CULTIVATION.

Having now traced the cultivation of plant-canes to maturity, as the manufacture of the produce forms no part of the arrangement of the Prize Essay, we must consider the canes to be cut and carried away, leaving the land for us to operate on in the cultivation of the rattoon.

It will be remembered that I advised the laying out of the land into beds, and the making of the rows in the same direction as the trenches run, as for one reason among others, it would facilitate the cultivation of the rattoons.

Supposing such advice to have been followed, each bed must have the trash burnt off it as soon as the canes have been carried away, a person being employed previously to haul the trash out of the wain tracks to prevent the fire from spreading. The burning off is an easy business, and cannot be calculated to cost more than a shilling an acre.

I wish the trash to be burned off as quickly as possible, before the long tops wither too much, as my object is to convert a part of the green matter into charcoal, and not to turn it all into ashes.—By burning the trash also, before it becomes perfectly dry, a great object will be obtained by preventing the moist rotten trash next to the ground from being consumed ; this matter is just in the state for affording nutriment to the plant, and should be ploughed in to enrich the soil. For it must be remembered, that I recommended ploughing the land and planting the canes without waiting for the delay and expense of manuring, as we would adopt such a course of cultivation as would enrich, instead of impoverish the land.—It is a great object, therefore, that all the rotten trash should be ploughed in. Liebig proves that the plants return as much humus to the soil, in the shape of excrements, as they extract as food from the soil ; the quantity of decaying vegetable matter to be ploughed in, is, therefore, an addition to the richness of the soil; and therefore, I say, that by this system we make the soil richer instead of poorer.

The excrementitious matters, as deposited in the soil, are injurious to the cane, and this is one reason why the cane, hitherto, has continued to decrease in luxuriance year after year, as the excrements increased, until they increased so much as to destroy the plant. The soil in reality was not poorer than before, but the matter that ought to be the food of the plants had changed its shape and become injurious. Ploughing, by exposing these excrements to the action of the oxygen of the atmosphere, causes a chemical action to take place, which reconverts them into nutritive matter.—By the process proposed we add nutritive matter to the soil, and we render innocuous what was before noxious matter. At the same time a considerable quantity of the ashes of the plant (from the dry vegetable matter burned) are returned to the soil to be ready for going through a similar course of re-organization, and the green vegetable matter is returned in the shape of charcoal, which is also a valuable addition to the soil, from its attraction, both of carbonic acid and ammonia.

By the old process of allowing the trash to rot on the surface of the soil, nearly all was lost in the shape of carbonic acid, by passing off into the atmosphere, a very small part only being absorbed by the leaves during the growth of the canes. But by our process, we return a large part at once into the soil, where it comes into immediate play.

When treating of manure, I alluded to the use of charcoal; I considered it, more properly speaking, as a corn crop manure, but conceived that it might prove beneficial in moderate quantities, more especially in dry districts. By the plan proposed of laying out the beds, we have an opportunity of increasing or diminishing our supply of charcoal, by applying the fire to each bed, sooner or later, as we wish to turn more into ashes or into charcoal, which we cannot do, if the cane-pieces are arranged and cut as at present. Parties must judge for themselves of the nature of their soil and climate, and of the advantages or disadvantages of the use of charcoal, as a manure, to determine the proper time for burning off the trash. If they delay the operation until the trash is all dry, they will have no charcoal, but all in the shape of ashes. I should recommend the course I have already indicated.

Burning off the trash has hitherto been objected to as an injurious practice. It is an injurious practice where not followed by the plough, as, although the ashes are a temporary stimulus, and cause the young sprouts to grow freely, the ground is so much exposed to the sun that it becomes caked like a brick, and so hard that the roots cannot penetrate it. Where, however, the land is frequently ploughed after the operation of burning off, the result is quite different, and proves the plan to be advantageous.

The operation of ploughing should be done with the hoe-plough, drawn by two cattle, as described in the cultivation of plant-canes, and the cost, as stated before, will be reckoned six-shillings. It is simply fallowing the land between each row. If the soil be of a light description, the operation may be performed by alternate rows, leaving the others to be ploughed in a few days afterwards. Most people will perform the ploughing, so as to mould the cane stool, from the long habit, thinking moulding to be an essential part of the cultivation of the cane.

My idea of the cultivation is, simply to enrich the earth, in the rows between the canes, as much as possible, and that then the cane-stool will send up abundance of strong healthy canes without any moulding. The first growth of sprouts that appear seldom become sugar-canes, but only keep up a circulation of the sap till the stool has vigour enough to send up strong luxuriant canes. When discussing the propriety of moulding plants, I showed that a cane did not grow in the manner commonly supposed, but from suckers; for the same reason I now argue, that moulding is unnecessary if the cane row receives good cultivation. The object of moulding rattoons hitherto has been to feed up the first sprouts, and to convert them into sugar-canes; these sprouts naturally improved under the process, and when the stool had strength to throw up suckers, the hand of man too often frustrated the efforts of nature, and rudely tore them away, thus leaving the shabby canes, and destroying the luxuriant ones.

If parties wish to fallow the rows, so as to throw the mould upon the cane-stools, I shall not object to it; only let the ploughing be as deep as possible.

As the beds are supposed to have been laid out on the plan recommended, the wains would carry the cane along the waintracks or trenches, and the cutting up of the cane-stools would be avoided; we shall therefore, not have to reckon anything for the supplying of the piece, which is usually requisite to make up for the destruction of the cane-stools by the wheels of the loaded wains.

From the study of Liebig, it would appear that, at this stage of our proceedings, we should return the stoke-hole ashes to the soil to be ploughed in, as he proves that land is impoverished by the removal of the inorganic matters. He, however, in another part, proves that the summer fallow is the means of restoring the alkalies and inorganic matters carried away; and this is the reason why I have not ordered them to be carried back to the soil, because I propose to give the canes a complete system of summer fallowing every year, and as a large part of the inorganic matters remain in the field in the shape of field trash and long tops, I expect our system of summer fallowing will disintegrate as much fresh alkalies, as will have been carried away in the canes to the mill, and which, after being consumed at the stoke-hole as fuel for boiling the cane-juice, become the perquisite of the washerwomen, or are used for making cement.

At a month old, and subsequently at two months old, the canes should be horse-hoed, as described in the cultivation of plant-canes, and at the same expense of three shillings an acre.

About this time also it may be necessary to hand-weed among the sprouts, where, of course, the plough or horse-hoe cannot reach. As there cannot be much to be done, the operation is not likely to exceed two shillings an acre. This operation will probably require to be repeated when the canes are from three to four months old.

At three months old I recommend a second ploughing with the hoe-plough, as deep as it will go.

At four months, and again at five months old, if necessary, horse-hoe; this will be the utmost extent of cultivation required: as, by this time, the canes will be very luxuriant, and the weeds destroyed by repeated pulverizations.

As I recommended the canes not to be trashed, and the suckers not to be pulled out, the cultivation is complete.

This system of rattoon cultivation is to be repeated annually, until it is thought advisable to plough the canes up, and replant them, which is likely to be at a very long date if the system of cultivation is continued.

Every year the weeds will become fewer and fewer, as they are never allowed to ripen their seeds, but if no weeds appear, the ploughings must be continued to loosen the soil.

As three quarters of the soil, that is, leaving eighteen inches for the width of the cane-stool and unploughed land, is annually put into as good and favorable a state for vegetation as at the beginning of the process of planting, the return annually from the cane should be three quarters of the return from the plant canes, or from one and a half to two tons an acre. I see no reason for doubting that, with such a system of cultivation, such a result would occur.

The expense of cultivating ratoons will be—	£.	s.
Burning off the trash, per acre	0	1
Hoe-Ploughing	0	6
Horse hoeing twice, at 3s.	0	6
Hoe-ploughing	0	6
Horse-Hoeing twice, at 3s.	0	6

	£.	s.
Hand-weeding twice, at 2s. - -	0	4
Hoeing trenches, by manual labour or horse-hoe, three times, at 1s. - -	0	3
	£1	12

Cost of sugar, reckoning the produce of a ton and a half per acre, £1 1s.; at two tons per acre, 16s.

In comparing this system of cane cultivation by Agricultural implements, with the most successful practices of the old system, I may state that the cheapest system of cultivation I have heard of, was the one I adopted myself on a level estate, with brick mould, and Montblanc Canes. I gave all the rattoons four cleanings with the common hoe, or, as Cobbett calls them, "miserable flat hoeings," at an expense of from ten to twelve shillings for each cleaning per acre; I did not trash them; and they yielded about a ton an acre. The expense was, therefore, rather more than two pounds a ton.

As I got a ton an acre by the common process, I do not think it is too much to expect that the produce will be doubled by the addition of vegetable matter to the soil, and by the constant ploughing, affording fresh food, and destroying the injurious matter deposited in the soil.

As it is impossible to draw up a statement of the cost of cultivation incurred by the present system of cane cultivation pursued, suitable to the different districts of the island, the comparative advantage to be derived from the proposed system must be left to each reader to decide for himself.

The saving of four shillings a ton in cartage of canes, and of two shillings in fencing the canes, and repairing the roads, must not be forgotten; as also the large saving from the non-application of manure, and the five per cent. lessened mortality among the stock, in addition to the actual saving effected in the cultivation itself.

CULTIVATION OF HILLY LAND.

With regard to the cultivation of hilly land, such as is too steep to come under the denomination of "such easy land as to present no real obstacle to the free use of the Plough," and which moderately hilly land is to be treated the same as level land; with regard to such steep hilly land, it is an object to see how far agricultural implements may be used to economise labour.

Where the land is so irregular that the line of draught is constantly changing, and prevents the use of a sufficient number of stock to draw the large Plough, the land had better be dug in the old plan, being laid in rows as nearly level as possible. The little Plough may then be used without a mould board, for loosening and pulverising the soil in the bottom of the cane-hole. The cultivation may then proceed in the common way by manual labour for the remainder of the crop.

In rattoons the trash should not be burned off, but as soon as it is half rotten, it may be hauled on alternate rows, and the intermediate ones be ploughed with the little Plough and two cattle, turning the furrow down the hill, as the land is supposed to be too steep to throw a furrow up the hill.

Afterwards the hoe-plough may be used as a horse-hoe for pulverizing the soil, by taking the mould board off, as the horse-hoes previously described, will scarcely be available from the steepness. The double quantity of trash accumulated on the one row will keep down the grass and weeds with less than the usual quantity of labour; whilst the other row will be pulverized by the Plough and enriched by the action of the atmosphere.

The next year the rows should be changed. This appears to be all the cultivation that steep land can receive by agricultural implements. But I recommend rattoons on hilly land to be better cultivated by the hoe than has been commonly done. It has been too commonly the practice to assert that the canes would not rattoon, and that therefore it was throwing away money upon them. This is something like giving a dog a bad name, and then hanging him. As far as my experience goes, I find that they will rattoon, if kept clean, though probably not as long as on level land; that they should have four cleanings by the time they are six months old, and then never be trashed or worked till the time of cutting. The ploughing in addition to this cultivation will increase the return, and cause them to rattoon longer.

It would be advisable, in hilly land, to apply the stokehole ashes as manure, and in many places charcoal might be beneficially added.

TIME REQUISITE FOR THE WORK TO BE PERFORMED.

Close ploughing plants, per acre	2 days,
Sub-soil ploughing	2
Harrowing	1 day
Ploughing furrows, less than	½
Four horse-hoeings	2
Hoe-ploughing	1
Plants per acre	8½

Hoe-ploughing rattoons twice, per acre	2 days
Horse hoeing, four times	2
Rattoons per acre	4 days
Twenty acres of plants, at 8⅕ days	164 days
One hundred rattoons, at 4 days	400
	564

Three ploughs working 200 days, or 40 weeks of five days each, more than equal to the cultivation of 120 acres of canes, or 42 acres per plough per annum.

CATTLE REQUISITE.

Twenty cattle only would be requisite for the work, if well tended. When the large plough was at work and two horse-hoes at the same time, the whole twenty would be at work daily; when only the three horse hoes, or hoe-ploughs were working, only twelve cattle would be at work daily, and eight would be resting.

The cattle to do this work (the cultivation of 120 acres of canes) though, must be well fed. Each cattle would require three acres of good Guinea grass pasture, with a supply of chopped cane-tops and skimmings at mid-day,

They should either be house-fed at night, each steer having his own stall, or be turned into a Guinea grass piece; and the same on Saturday and Sunday, and when resting.

With good feeding they can work four or five hours daily for five days in the week, and without being distressed. The necks of the cattle should be rubbed, on their leaving work, with some low wines to prevent swelling.

CONCLUSION.

In concluding my Essay I beg to make a few remarks:

In adapting the cultivation of the cane to the exigencies of the times, and in endeavouring to show how it may be improved by the aid of the science of agriculture, I have, in proposing a system intended to be as perfect as possible, proposed so many alterations, that it will be advisable to say a few words on the way in which they should be carried into effect.

This should be attempted very gradually. I have endeavoured to explain the reasons why the former practices were disadvantageous, and also why the proposed plans are likely to be the contrary, No change should be undertaken till the party is satisfied of the correctness of the reasoning; he should observe and study for himself, and then when perfectly satisfied in his mind that it is correct, bring it into effect, by degrees, as he has opportunity.

It is a difficult thing to effect an alteration in established practices, and too much should not be attempted at once.

In ploughing land preparatory for planting, try a part of the cane-holes at the width recommended by me, and making the furrow in the way indicated.

If a party is afraid of the expense of laying out the beds as directed, or has not liberty to do so, let him still remember the reasons given for the operation, and make his arrangements as nearly similar as he can.

If a party has hitherto been an advocate for trashing canes, let him try a few acres without.

If he has a piece of first rattoon canes that was ploughed when planted, let him try the effect of tillage with the hoe-plough, or horse-hoe ; or not having these instruments, let him plough it with the large plough without the mould-board, while there are no sprouts to be trampled on by the cattle. Old rattoons grow so irregularly, some on the bank and some in the hole, that it is impossible to plough them, But if they were ploughed yearly from the time of planting they would be quite different.

In the same way I trust all the suggestions will be received and tried as opportunity offers. It is useful to know what is the best system of cultivation, although we cannot hope to be able to adopt it in all its details for some time, as we may thus always keep it in view and be approximating to it.

I now add an account of a system of sugar-making in a distant part of the world; it will repay perusal, as it shows, by the comparison with our own system how much room we have for improvement, and it bears out my statements in many particulars.

ACCOUNT OF SUGAR MAKING IN BATAVIA, FROM EAST INDIA REPORT.

Botham says, " The proprietor is generally a rich Dutchman, who has built on it substantial works. He lets the estate (say of three hundred or more acres) to a Chinese, who lives on, and superintends it, and who re-lets it to free men, in parcels of fifty or sixty acres, on condition that they shall plant it in canes, for so much for every pecul 133⅓ lbs. of sugar produced. The superintendent collects people from the adjacent villages to take off his crop. One set of task-men, with their carts and buffaloes, cut the canes, carry them to the mill, and grind them; a second set boil them; a third clay and basket them for the market, at so much per pecul: thus the renter knows, with certainty, what every pecul will cost him. He has no unnecessary expense, for when the crop is over the task-men go home; and, for seven months in the year, there only remain on the estate the cane-planters, preparing the next crop. By dividing the labour it is cheaper and better done. The common price of labour is from nine-pence to ten pence a-day—but task-men gain considerably more, not only from extra work, but from being considered artists in their several branches. They do not make spirits on the sugar estate: the molasses and skimmings are sent for sale to Batavia, where one distillery may buy the produce of one hundred estates. Here is a vast saving in making spirits; not as in the West-Indies, a distillery for each estate. The hoe, almost the sole implement of the West is there scarcely used; the lands are well-ploughed by a light plough, with a single buffalo, a drill is then ploughed, and a person, with two baskets, filled with cane-plants, suspended to a stick across his shoulders, drops into the furrow plants alternately from each basket, covering them at the same time with earth with his feet. Young canes are kept often ploughed, as a weeding, and the hoe is used to weed round the plant when very young; but of this there is little need if the land has been sufficiently ploughed. The improvement in making the cane into sugar, at Batavia, keeps pace with that in its culture.—Evaporation being in proportion to the surface, their boilers have as much of it as possible.

Stavorinus, in his account of Java, speaking of the neighbourhood of Batavia, says, "If the soil be good and adapted to the cultivation of the cane, it can be cut four times; on some grounds less often, and on others only once."

Crawford, speaking of the same district, says, "Two rattoon crops are usually taken, and sometimes a third. Sugar-cane is usually planted in dry arable lands, and never in the finest soils.—The size of the works may be estimated from the quantity of sugar manufactured by them, which is commonly from 950 to 2,400 cwt. in five weeks, the usual duration of the manufacturing season. The machinery is always moved by cattle, and never by water.—The cylinders of the mill are of wood instead of iron, and the boilers of iron instead of copper."

Though not specifically mentioned there appears to be only one cattle mill to each estate; from ten to twenty-four tons a week appears to be made, which is large work for a cattle-mill; perhaps to make the larger quantity, two mills may be used, without we are to consider that *five weeks* is a misprint, and that *five months* should be substituted, which would make it agree with Botham's account; but then there should have been no occasion for the author to have expressed his surprise at the size of the works. The same author reckons 120 pair of baffaloes for the labors of the field and mill, which, with the value of the mill, he estimates at 12 000 dollars, and to be equal to the manufacture of the produce of 198¼ English acres, yielding 2,277 cwt. of clayed sugar. An English acre of canes in middling land, cultivated without manure, produces, he says, 1,285 lbs. of clayed sugar. The best lands will give an average of 1815 lbs. Rich cane-juice yields 31¼ per cent. of sugar, (a most enormous proportion! and if such is correct, may account for the large work done by the mill,) middling 25, and the worst 20, or on an average of all, 25 per cent.

Even this is enormously high yielding. In this country it is considered an average yielding when we obtain a pound of sugar from a gallon of juice, which is only 10 per cent. I think it probable that, when he says the juice yields 25 per cent. of sugar, he means of sugar in the cooler, that is, including molasses. But even in this view of the case, we cannot compete with them. If we get a 40 inch hogshead of sugar, and 70 gallons of molasses, or about 300 gallons of sugar and molasses combined, from 1500 gallons of cane-juice, we esteem it capital yielding, and yet that is only 20 per cent.

NOTE.

A party in one of the Windward Islands, in a prospectus of a work on cane cultivation, advertises that he can increase the saccharine matter in the cane fifty per cent. by a system of cultivation. Supposing that he is able to do so, which I think likely, I have no doubt he purposes doing it by the same means of cultivation as I have proposed, namely, frequent ploughing, and the addition of vegetable matter to the soil, so as to furnish an excess of carbonic acid, and therefore to augment the deposit of sugar.

NOTE.

Trashing canes makes them stronger in the stem and stand up, instead of lodging: this can only be by increasing the quantity of woody fibre. It is a matter well worthy of investigation, whether such an increase of woody fibre is not obtained at the expense of the sugar in the cane. Sugar and woody fibre are almost identical in their composition, and it may easily be supposed that the increased effect of light and heat, caused by pulling off the leaves, may effect such a chemical transformation. This result appears more probable from the fact that the juice of the cane is much richer in the East Indies than here, where the trash is pulled off the canes, instead of being carefully tied on them as there.

NOTE.

If twice after any party is inclined to trash the canes once or the cultivation with horse-hoes is complete, and while still standing upright, I should advise him to try a bundle of dead bamboo branches, dragged by a steer. Let the front part of the bundle be made small, but the back part expanding, so as to rub against the canes when drawn along. I have no doubt it would pull off the greater part of the dead trash, and the elasticity of the canes would prevent their breaking.

NOTE.

As I am sometimes taxed with being a too theoretical planter, I now annex copies of two interesting letters from the gentlemen I have alluded to, as being two of the best practical planters in the island ; who are certainly not in the least degree theoretical planters ; and whose valuable practical experience has been of much service to me in confirming the opinions I had formed.

These letters are written at my request to show their opinions on the chief points of alteration I have argued in my Essay, namely planting canes in wide rows, and not trashing them.

Both these gentlemen have arrived at nearly the same results as myself, from their own personal experience, quite independently of any communications they have had with me on the subject ; the letters will, therefore, be read with interest :—

DEAR SIR,

At your request, I beg to inform you that I would not, if I had my own way, make any cane-holes nearer than six feet.—I would plant the tops along the row about two in six feet, according to the quality of the soil.

From my own experience, I have arrived at the conclusion that we plant the canes too thick, more especially when it is intended, to cultivate between the canes with Agricultural implements as you propose in your valuable Essay.

On this estate we had two cane-pieces ploughed for plants. The rows on the one were made scarcely four feet apart, and, on this piece, the canes grew tall, but small, like supple-jacks, and when cut made a hogshead and a half an acre. The other piece was planted at the distance of five feet and a-half between the rows; the canes grew stout and luxuriant, and when cut, made three hogsheads per acre, and better produce. Both pieces were put in without manure, except the grass and trash being ploughed down.

I also think, that by planting the canes at wider distances, a great deal of trashing might be avoided; I think it might be done away with altogether in the case of rattoons, but am not sure that it would be safe in the case of plants to omit it entirely. Although, in the case of the two pieces of plants alluded to above, the one which only made a hogshead and a half per acre was trashed twice, and the other which was planted wide, and made three hogsheads per acre was never trashed at all. I have, on several occasions, found the produce from untrashed canes to be of a much better quality than I *expected*, and the yielding also larger than anticipated. This leads me to think that the practice of trashing might be given up to a much greater extent than it has been.

I quite agree with the plans you propose for the cultivation of the cane by Agricultural implements, and have, in fact, been much pleased with the perusal of your entire Essay, but more particularly with the practical parts, which I think very excellent.

&c. &c.

J. M.

NOTE.

Dear Sir,

At your request, I beg to inform you, that, from mature observation, I have come to the conclusion, had I my own way, not to make any cane-holes closer than five feet on poor soil, and from six to seven feet on richer alluvial soils, according to circumstances; and that I would plant the tops, of a foot each in length, across the hole, and at distances of from twelve to sixteen inches apart, thereby giving full room for the growth and perfect maturation of the cane. It is fully well known than the canes planted in rows of this width, and at the distances mentioned, throw out a greater number of suckers, and of greater luxuriance than when planted in narrow rows, and the tops at closer distances.

I also consider that by planting the cane in wider rows than what is generally practiced, a great deal of trashing might be safely avoided, and, in some instances, might be done away with altogether, provided the intervals between the rows be kept clear of grass and weeds. Of course I do not allude to heavy plants, put in with animal manure, but even in this instance I consider we have hitherto expended labour unnecessary, and without any commensurate advantage, and very often to the great injury of the crop, particularly when the cane, from heavy weather or other cause, becomes twisted about and lodged, when, on no consideration, would I advise a hand to be put through them.

Last year, on this estate, several pieces of rattoon canes had to remain over from unavoidable circumstances, some ten, and some even twelve months beyond the time they should have been cut, according to the usual routine of plantation economy ; between which periods no cultivation was bestowed on them, yet, to my astonishment, the yielding was far greater than my sanguine expectations led me to expect, and the produce from them equal to any made from the highest cultivated pieces on the estate. These are facts which cannot be be gainsayed, and will prove, I hope, to your satisfaction, the truth of the argument I introduced to you some time ago on the subject of overtrashing. The sugar made from some of the pieces alluded to was, I may say, entirely made from sucker canes, (the original cane having been long rotten on the ground,) and which never had a leaf stripped off until the day of cutting.

By having the rows at the distances described, it affords greater facility for using Agricultural implements with advantage, such as the small plough for moulding, and the various harrows lately introduced for grass weeding and moulding.

What induced me, in the first instance, to notice the great advantage derivable from wide rows, was from an occurrence which took place on this estate about two years ago, namely, one of the European ploughmen got sick, and I sent a black man to follow the horses; not being accustomed to work them, they became restive and sulky, and diverged from the line of cane row, thereby making some of them eight feet asunder; the result was, the canes in these rows were much stouter, and of greater luxuriance in every sense of the word, than any on the piece, or on the land of the same description ; did not lodge nearly so much as the others in narrow rows; were much more easily cultivated; and I thought suffered less from vermin.

These rough remarks I submit to you with great pleasure, and although I do not, in every instance, agree with you in your Essay, yet I am bound to say I fully concur with you in your general views, and in the plans you propose for the cultivation of the cane by Agricultural implements, by preparing the land, and so laying out the rows, that they may be used with facility and profit : and in conclusion, I must say I have derived much pleasure from the perusal of your valuable and scientific paper, more particularly the practical parts, which are very good, and much to the purpose.

I am, &c. &c. J, P.

JAMAICA AGRICULTURE.

TO THE EDITOR OF THE JAMAICA TIMES.

September 9, 1843.

Sir,—The proposition so frequently advocated in your columns, of forming a Central Agricultural Society, for the promotion of the agricultural interests of the island generally, is at length likely to be immediately brought into play, thanks to the exertions of the Rev. Dr. Stewart, of Clarendon, for resuscitating the subject. The project was cordially approved of at the St. Mary's Ploughing Match the other day, and delegates will be immediately appointed to carry the plan into execution. St. Ann's and Metcalfe, will immediately follow the good example, and no doubt all the other Societies will at once call extraordinary meetings to elect members for the Agricultural House of Assembly. Fortunately, like Daniel O'Connell's Parliament of three hundred in Dublin, we can meet peaceably without writs being issed for our election ! Immediately on our coming together, we must proceed to place ourselves under the especial patronage of His Excellency.

I propose, following the fashion of the day, that the title should be Young Jamaica—a Society formed of young, active, intelligent planters, resolutely bent on regenerating the prosperity of the Island. There is a " Young England," anxious for the welfare of our Mother Country ; there is a " Young France" ; and there is also a " Young Germany" ; I think then, we cannot do better than stile our Society " Young Jamaica." It has a noble office to perform, —the regeneration of our prosperity, and who shall doubt that under the blessing of God, our efforts shall not be crowned with success.

The first meeting must be preliminary to arrange our mode of proceedings for the future, draw up regulations, &c.

The second meeting should be for a week in January, as soon after the twelfth as convenient, when each member should furnish the result of all the crops in his district up to the end of the year, proved by the shipments to the 12th of January. He should also come prepared with probable estimates for the ensuing crop. As these will be regularly published, they will be a great guidance to the public, proprietors, &c.

The Society should meet again for a week, immediately after the sailing of the 1st of August ships, by which means an accurate account will be kept of the progress of the crops.

There are many other things, which, whether I have the honor of a seat at their board or not, I shall take leave to bring before their notice.

The chief, is a method of remunerating both Attorneys and Overseers, more conducive to the interests of the proprietors.

The rate of wages and amount of work to be performed should also be considered.

A better and easier system of keeping estates accounts.

The keeping of Statistical tables of Agriculture, population, &c.

The consideration of all proposals for the improvement of agriculture, machinery, and manufactures; if approved, the giving them a fair trial by each member in his own district, and the reporting on them on their return at the next half yearly meeting.

The awarding of premiums and medals to deserving parties.

The keeping a record of the rain fallen in each district.

The publishing the transactions of each meeting.

The following is a sketch of the plan I propose for the payment of Attorneys and Overseers. I am satisfied that such an alteration would change the state of society, and the prospects of the country, in the course of five years wonderfully for the better. I strongly recommend those who are now contemplating the abandonment of their properties, and who are unfortunately at present a large class, to give the plan a fair trial. The Overseers will willingly meet them. Under such an arrangement, digging cane holes would soon become obsolete; and all parties striving to reduce expenses, wages would fall to a fair standard, and the labourers would be obliged to give a fair day's work.

There is a notion abroad and very prevalent, that the throwing up of all the small Estates will benefit the large ones; it appears to me, quite the reverse; for although the wages may be partially reduced, the falling off of the exports would hasten the introduction of Foreign Sugar, which would far more than counterbalance the profits gained by the lowering of wages. "*Live* therefore, and let *others* live." Reduce wages by employing cattle and agricultural implements, and by making it the interest of the planters to economise; and give the small estates an opportunity of surmounting their difficulties, and of adding to the wealth of the island.

I have shown the effect of the ruin of the small estates on the large ones by causing the introduction of slave grown sugar. What would be the effect on the Pen-keepers, a class who are now comparatively speaking, doing well? Many of the small estates will breed cattle, and increase the number of stock offered for sale; but the demand for them will be at the same time lessened; for who are to buy planters stock? they will be a drug in the market. Who is to eat beef? half the Overseers will be out of employ, and the labourers will have diminished means; how then will the butchers thrive? I hope I have said enough to prevent parties building their hopes of prosperity, on the downfall of others.

If Overseers had money, the best thing for the general good, would be to lease the estates at a fair price; but not having money let the proprietors provide half or two thirds of the requisite funds as the crop goes on through their present Attorneys, and give the Overseers an interest in the Estates on some such plan as this:—

The Attorney to make the general arrangement for the management of the estates, as to the weekly amount of expenditure, the number of stock to be kept up, the quantity of plants to be established, &c.; then the Overseer to carry it into effect the best way he can.

The Attorney to act as agent; to furnish the stipulated funds as agreed upon; to ship the produce; to transmit the monthly returns; and occasionally to visit the estate to see that the agreement is fulfilled. To be paid a fixed salary of from one hundred to two hundred a year, according to the capability of the estate.

The Overseer to have the sole management in all minor matters of the Estate. To be allowed one hundred per annum for feeding himself and the bookkeeper, but to have no supplies from home. To receive as salary from one tenth to one fourth of the nett proceeds of the estate. If he made no nett proceeds, he would get no salary, but merely a bare living, which would be all he deserved, if he could not make the Estate remunerative when under his sole management.

The proprietors' minds would be relieved from the constant state of uncertainty they are in at present, knowing that the overseer would do everything that was possible for his own sake, to make the estate productive.

Domestics' wages to be charged in the pay bill, the one hundred pounds being for feeding Overseer and Bookkeeper, and keeping up the furniture. The furniture to be taken at a valuation, and a similar value left.

Bookkeepers' salary as usual.

Overseers not to be discharged till the end of the year, and to have three months' notice ; but his berth to be considered permanent. Matrimony to be encouraged.

I think such a system as this would be a vast improvement ; what do you say Messieurs Overseers, do you think you could make the Estates pay their way ? Would you dig cane holes at four pounds, when you can plough at one pound per acre ? Surely not. Then my advice to you is—if any of you are living on any Estate which the proprietor contemplates giving up, write to him and offer your services on this plan, and ask him to give you a fair trial for two or three years, and if possible, interest " Young Jamaica" in your behalf, who will soon find out if you are deserving of encouragement.

AGRICOLA.

JAMAICA AGRICULTURE.

TO THE EDITOR OF THE JAMAICA TIMES.

20TH SEPTEMBER, 1843.

SIR,—As there is much pleasure in giving as in receiving information, and as in the present depressed state of affairs encouraging information may prove of much benefit in supporting the energies of the desponding, I have determined upon giving you an account of a two day's visit to a beautiful property called Hyde Hall, in Trelawny. I have no hesitation in mentioning the name, because all I have to say is in praise, and on the principle of "Honor to whom honor is due," I think the parties should all meet with the credit due to them. I am sure the proprietor will pardon the liberty I take when he reflects how much good his example thus publicly held up may be the means of doing to other parties like himself, deeply interested in Jamaica property.

It is saying a good deal, but it is not saying more than is correct, when I say that I was pleased with everything. The system adopted is the one which must be followed to insure the future prosperity of the island and I recommend all parties, proprietor, attorney, overseer, and labourer, all as soon as possible, to follow the example thus practically set before them.

The estate is a very fine one, but one that like all others has seen bad times during the last few years; it is now, however, owing to the untiring energy of the proprietor, rapidly rising into prosperity. All the elements of prosperity are there, and success must crown the efforts.

The proprietor, Mr. Shirley, is one of those parties who think that agricultural and mechanical improvements are the best means of insuring success under the new system. He accordingly sends out all kind of agricultural implements that are likely to prove successful. There are now on the property eight or ten ploughs of all shapes and sizes, horse-hoes, trash rakes, trash cutting machines, &c. in great variety; so that everything may be fairly tried to insure success. In addition to machines for saving labour in the field, he has adopted machinery for saving labour about the manufactory, and has erected railroads for carrying all the green trash from the mills. He has also a most ingenious cane carrying machine to save labour at the breezemill. He is now engaged in ascertaining the value of all the manures commonly used at home, having had a piece of plant canes put in, each bed of which is manured by a different kind of manure, to ascertain the relative value of them; and he has just sent out a machine in the expectation of being able to cut the ripe canes by horse power; but it has not yet been tried. Another favourable trait in his system of management, and in my opinion it is a matter of great consequence, is his keeping up the regular number of bookkeepers. The discharging of bookkeepers appears to me to be a most "penny wise and pound foolish business;" they are more necessary now than ever: considering the large sums of money that are paid away, surely it is advisable to see that a fair equivalent is obtained for the money expended. Finally he has appointed as his attorney, Mr. C. Stewart, a planter deservedly popular on the Northside, being a determined advocate for the use of the plough; and as his overseer, and I believe joint attorney, Mr. Forrester, a planter of good experience, and latterly having had the benefit of four or five years of the practice of modern farming at home. Two parties better calculated to carry his views into effect he could not have chosen, and long may all of them reap a mutual harvest. Under such auspices, Hyde Hall is likely to become, and without expense to the country, the model farm of the Island.

But the labourers also are to come in for their share of praise. One spell of people took off the whole of last crop, 150 or 160 hogsheads, without changing. I think that is saying a great deal for them. The labour is made as easy as possible for them by the use of machinery.

The chief mill employed is a mule mill, which grinds two-and a-half hogsheads in day light as a regular thing; it is one of Collinge's horizontal mills, and is very long in the rollers, so that the canes can be distributed from end to end without increasing the strain of machinery by crossing each other. To insure regular feeding, there is a very simple contrivance used that I never saw before, a smaller frame work like the teeth of a rake or comb in front of the colliers to insure the canes being spread regularly in feeding. I did not see the mill at work; but the overseer informs me that the mules are worked three abreast.

The green trash is carried away from the mill to the trash-house in a cart along a railway of very simple and economical construction. One woman loads the cart at a shilling a-day, and one man rolls it to the trash-house and upsets it at one shilling and sixpence a-day; thus the carrying away the trash from two and a half hogsheads of sugar costs only two shillings and sixpence, or a shilling per hogshead, a circumstance scarcely credible, but strongly showing what ingenuity and perseverance may accomplish. The operation often costs from six to eight, or even ten shillings per hogshead.

The contrivance for carrying up canes to the breeze mill is beautifully simple. I was quite pleased with it, and recommend those who have a high or long ascent for carrying up canes to the mill to take a hint. There is an inclined plane or platform from the cane yard to the mill, the top end is just the width of one of the carts used for carrying up the canes; the bottom end is about three times as wide, making a triangle. One of the cane carts stands at the head of the platform, and in front of the mill, where it is used instead of a cane table, until it is emptied of canes. When emptied the cart is drawn down by a mule with a rope and block, and the same operation hoists up a cart full of canes, which a couple of young boys or girls have been loading in the cane yard, whilst the other cart was at the top. These two carts are thus kept emptying and filling with less than half the labour usually employed. The chief beauty of the contrivance lies in the way in which the carts are made to pass each other, so that the full cart is always placed in front of the mill where the cane table usually stands. To effect this purpose the platform is made about three times as wide at the bottom as at the top, and at the extreme edge of each side of it, is a guide rail to guide the cart, there being no rail to the inside wheel of each cart—each cart therefore, traverses at its own side of the platform till nearing the top, when it runs into the exact position lately occupied by the other cart. The empty cart in descending arrives at the wide part of the platform before the full cart in ascending arrives at the narrow part, and thus they are made to pass each other without touching. I could not ascertain whose contrivance it was, but it does him great credit.

As may be supposed from the character of the managing men, the cane holes are all ploughed. The plants are also all cultivated with the scarifier or horse hoe, which has been in use there about four years, and as far as I can learn, that appears to be the first estate where it has been regularly used. This instrument appears to me to be identically the same with the one now commonly called Edie's harrow; if I am right in my supposition they will take precedence of Mr. Edie in point of time, for introducing it into use in cane cultivation. I should advise Mr. Edie to inquire into the matter. The scarifier, as Mr. Forrester calls it, and which he says is quite commonly in use in England, is a combination of a flat hoe, two rows of vertical coulters, and two bent coulters or knives for cutting the roots below the surface. As a considerable degree of merit is due to any party introducing an useful implement, the party who is really the first in the field should gain the credit.—Edie's application of it became more generally known from the notice taken of it by by the St. Andrew's Society, an advantage which perhaps the other party was not fortunate enough to obtain. I must leave the two parties to decide between themselves on the point at issue. Mr. Forrester has got some alterations going on in the instrument to make it still further applicable.

The application of Agricultural implements and machinery has given such a command of labour, that the great gang are now working at one shilling and three-pence, the second gang at nine pence, and the third at six-pence a-day, and even at these prices there is very little employment for them. The gross expenditure of wages is largely reduced, and the crop is rapidly rising, a result which I fancy most parties would be glad to realise. The book is open, let them take a leaf freely.

AGRICOLA.

ESSAY

ON THE DEFECTS OF THE AGRICULTURAL SYSTEM HITHERTO PURSUED IN JAMAICA.

Absenteeism will express in one word the radical cause of the defects of the system of agriculture pursued in this island. The prosperity of the island will commence and progress as the parties now managing the agricultural operations, have a more direct interest in the result of their labours. No man can do for another what he would do for himself, especially where the relations are so complicated as they are in the management of farming properties like sugar estates, coffee plantations, or breeding pens. It is expecting more than human nature is capable of, to suppose that a man can from morning till night, from day to day, from week to week, from month to month, exercise that constant control and superintendence over the affairs of other people, that he would over his own; or that he will maintain that incessant struggle for economy in the expenditure of other people's money, that he would, if it were coming out of his own pocket. It is a struggle of one man against a hundred. The labourers are, naturally enough, contending for the exaction of the highest amount of wages they can obtain, the manager, on the other hand, has to maintain a constant struggle, not on his own behalf, but on behalf of a distant party of whom he is the representative of a representative; can it be wondered at then, if he gives way in the struggle, and if the hundred personally interested parties overcome the one disinterested unassisted party?

In former times when properties in these climes were mines of wealth, it was natural that the proprietors reaping large profits should wish to escape the unhealthiness of the climate, the risk of life from the existing state of the slave population, and should wish to enjoy the pleasures of the society, and the comforts of life they had been accustomed to, or could obtain at home. They therefore deputed parties brought up in this country and accustomed to the management of estates, to act as their agents, while they enjoyed the "otium cum dignitate" at home. From the existing state of society, from the price of produce, and other causes, these parties, although they did not make the properties so productive as they might have been under the proprietor's own care, still managed to extract large profits from them, and the proprietors were satisfied to receive this portion, and to live at leisure in Britain. The agent having an interest distinct from that of his employer, namely, the making of his own fortune as quickly as possible, that he might return to his native land and enjoy it, devoted only a part of his time to looking after the affairs of the estate committed to his charge. It could therefore not be expected to continue as productive as when the proprietor devoted his sole attention to it.—Through the death of other parties, or through interest or friendship, other properties were committed to this same agent's trust, then came contending interests, each of which he was bound to promote. As attorney of a breeding pen he had stock to dispose of, and he was bound to obtain the highest possible price; and as the purchase of stock was only one item in the expenditure of the sugar or coffee property, his interest as attorney of the breeding pen predominated over his interest as attorney of the sugar or coffee property, and thus he reconciled to his conscience the purchasing of the largest number of stock, and at the highest price. But he had often a far less satisfactory reason for the transaction; he purchased on speculation cargoes of cattle, or had a pen of his own, and then he would supply his own stock, and the custom of the country—custom which sanctions so many bad practices, sanctioned the transaction.

Not only was the attorney agent for a breeding pen, as well as for a sugar estate or coffee property, but frequently also he was agent for a jobbing gang, or possessed one of his own; or, at any rate, some particular friend whom he wished to oblige, had one.—It was to this branch of rural economy that each overseer or deputy manager looked forward as a profitable investment for his savings of salary, usually purchasing a slave or two at a time, until by degrees he formed a jobbing gang of slave labourers. What more natural then than the attorney should employ such gangs (having himself made money by similar means) to assist in the cultivation both of the sugar and coffee properties? But, it may be said, that the labourers on the estates were sufficient for the cultivation of them; so they might have been when the proprietor managed for himself; but here another cause acted in opposition to the real interest of the proprietor. The usual mode of remunerating the attorneys was by paying them a percentage on the gross proceeds of the crop, and not on the nett proceeds, which would have better secured the proprietors' interests. The attorney, therefore, by the increased exertions of the slave, and by the hiring of jobbing gangs, endeavoured to increase the extent of the crops for the sake of his own profits. As the price of produce fell, he was also spurred on still more to increase the crops in the hopes of continuing the same income to the proprietor by making up in quantity what was lost in value. To effect these two objects, as soon as the slaves on the property naturally decreased, jobbing gangs were further employed, and at an increased rate of hire, but this only made matters worse.

The profits of the estates diminished, the proprietor lived up to his former income, and was obliged to borrow money from the merchants to do so, and thus sprung up another interest also in opposition to the proprietor's. As the mortgages increased, the produce was required to be shipped to the merchant in his own vessels, and at his own rate of freight; the supplies necessary for carrying on the estate were also supplied by the same merchant, and usually in far larger quantities than requisite even under the careless management of an irresponsible agent; the interest of the money accumulated, and thus matters run on from worse to worse, till the estates changed hands, and the proprietors were ruined.

The estates thus fell into the hands of parties who had never resided in the tropics, who knew nothing of the proper mode of management, and who were therefore compelled to a greater extent than the first proprietors, to intrust them entirely to the management of resident planters. The same system of management was again repeated, and with the same results; the estates again changed hands, until scarcely one estate in a hundred, notwithstanding the enormous profits they formerly yielded, remains in the family of the original proprietors.

The effect on the system of agriculture was equally injurious as on the general management of estates. The expensive system of digging cane holes was persisted in instead of the simple and easy method of ploughing them, so often and so strongly recommended in lieu of it, self interest so totally blinding the intellectual faculties that the planters actually persuaded themselves that it was an injurious practice. As the land grew poorer for want of the master's superintending care in the economical making and applying of manure, and for want of his constant attention and skill in the cultivation of his fields, the extent of land to be dug was increased in the vain hope of keeping up the crop to the same amount for the agent's profit and reputation, however much the proprietor's profit might be thereby diminished, or even if the system left him no profit at all.

If such a system were ruinous to the proprietors when slavery existed, how much more so must it be now when every act of labour, however trifling, has to be paid for—when, owing to the transition from slavery to freedom, the crops have been reduced to the lowest ebb, and when, owing to the extensive cultivation of our staple products in other branches of the British dominions particularly in the East, the price of produce is reduced to a low point.

The remedy is obvious; let the proprietors come out and live on their properties; let them lease their properties, (selling at present, except at a ruinously low price, is out of the question); or let them make the planter resident on the property a partner in the profits and losses of the estate; and in a few years the prospects of the country will be wonderfully changed for the better. Of the three modes, I should recommend the latter as most beneficial to the proprietor, without he is acquainted with the conducting of estates, and has temper enough to put up with the annoyances of the labourers. Give the overseer a reasonable share of the profits for his remuneration; let him have his own way; if he is able to advance funds of his own let him do so, and not draw for any money till after the shipment of the produce. He will then do whatever he knows beneficial, because his own interest is identified with the proprietor's; he will consider himself permanent in his berth, become a married man, and a respectable member of society. The labourers will do any thing that can reasonably be expected when the proprietor is resident, or where he is represented by a lessee or a personally interested party; they will do more for a resident attorney than for an overseer, and more for a proprietor, than for a resident attorney. The labourers exact the highest amount of wages they can from an overseer, because they know he will rather pay it than cause a stoppage of all work by refusing the demand; in which case, frequently the only thanks he gets for his trouble is his discharge; but where the planter is permanently located they soon come to a good understanding with him. The moment an overseer was made a partner in the concern, he would adopt all the new modes of economical cultivation that have been successfully tried by other parties, and the introduction of which depends entirely on his skill and perseverance. How can a man be expected to plant without he can hope to reap? Let then that hope be held out to him, and a profitable harvest will soon follow.

When a rich capitalist proposes to himself to embark his money in mercantile transactions, what course does he pursue? He remains himself in London as the grand centre of business, but sets up minor establishments in various quarters of the world; and what system does he pursue in managing the branches?—Does be appoint clerks and write them by every packet 'buy this,'—'sell that,'—'do this, that, and the other?' No, he appoints a partner in every spot, whose interest being united with his own, he can depend upon for managing the concern in the most advantageous way. Exactly similar should be the management of estates—a proprietor has ten thousand pounds capital sunk in one—twenty in another—five in a third, and so on; let him then appoint a partner at each as he would in any other mercantile establishment, for the management of estates, is nearly, if not equally, complicated with that of mercantile branches. It is a machine of which there is wheel within wheel, all of which must be kept in working order else the whole goes wrong. Mismangement in one part will take away the profits in another; and nothing but the master's eye and self-interest are sufficient to insure that unremitted attention to every part that is now requisite to insure a profit.—With these, large profits may still be made. By the improved modes of agriculture, the crops may be increased beyond what they ever were. Property will become more valuable than ever, and in a few short years freedom, aided by British skill and enterprise, will beat slavery out of the field.

NOTE.

1. This is looking at the matter in the most favorable point of view, and supposing that the party managing had full liberty of action and could do whatever he thinks advisable; but such is seldom the case—such implicit confidence is rarely placed in him, how much more so must this result take place then when the part cannot act with the necessary promptitude and decision.

THE PRIZE ESSAYS.

No. 1.

TO THE EDITOR OF THE JAMAICA TIMES.

November 27, 1843.

THE Essays on the economical cultivation of the sugar-cane being at length presented to the public, it is a matter of some importance to the country that they should be carefully reviewed. This task I now propose to myself, and trust that I may be enabled to do it in the spirit of fairness and good feeling.

The Judges have awarded the prize to the best of their ability and judgment, but it remains with the planters and the public generally to confirm or annul that decision. True, the money must remain, right or wrong, where it has been bestowed; but the public have the power, and will no doubt exercise it, of awarding the honor, which is of far more consequence than the money, to whom they may think fit. That the judges have acted honestly and conscientiously, I think nobody will doubt, but that they have arrived at a most erroneous conclusion, every planter who reads the volume will, I think, equally affirm. Such being the case, the other Essays appeal to the public to decide on their respective merits. As an humble individual of that public, and as one who has never abstained from expressing his opinion on Agricultural matters, I must beg to be allowed to criticise the writings now before us; the public good demands it, and therefore I am ready to perform the duty. I am quite aware that I am liable to have my motives misrepresented, but I trust I may acquit myself of the task without fear, favour, or affection.

The prize having been awarded to No. 1, this Essay naturally comes first under consideration. But before entering on the task, it will be well to consider what are the requisites for a successful Essay. The subject proposed being the economical cultivation of the sugar cane, the Essay might naturally be expected to treat of the different varieties of cane, showing those most valuable for cultivation: the soil best adapted for the cultivation of the cane, and the means to be employed to ameliorate the inferior kinds, and bring them as nearly as possible to the condition of the best. It might naturally be expected to treat of the preparation of the soil in the cheapest and easiest manner for the reception of the cane-plants. It should then treat of the easiest and cheapest system of planting the tops; of applying the manure; and of cultivating the cane until it arrives at maturity. Every proposition different from the usual practice should be supported by argument, and proved to be economical by calculation. The errors of previous practices should be pointed out, and proved to be fallacious. The instruments proposed for use should be simple and feasible; it is not necessary that they should have been tried as the terms of competition did not require it, but they should bear on their face a strong probability of success. The plant canes having been brought to maturity, the Essay, without any party proposes a method of cutting them more economically than by the usual practice, reaches its limit for the present; the carriage of the canes to the mill, and the manufacture of the produce not being any part of the cultivation of the cane, and therefore not forming part of the terms of competition. The Essay might then be expected to resume the cultivation of the cane during the remainder of its growth in the state of rattoons. In addition to all this it would be expected that the different varieties of manure should be discussed, and their relative merits and costs stated. Such might reasonably be expected from all the competitors for such a handsome prize: good writing was not expected, but good sense; and that the plans should be clearly and methodically arranged and expressed, and the advantages and disadvantages clearly shown. These appear to me to be the great requisites, and by these rules shall I test the Essays.

Judged by these rules, No. 1 has excluded itself from the competition, for the cultivation proposed, instead of being cheaper and easier, is more expensive and more difficult of execution than the present system. The methods proposed are not founded on argument or proved by calculation: the implements of Agriculture recommended, bear the stamp of impossibility; many essentials are not treated of; and the whole Essay is confused, obscure, and un-planterlike. That any one of the Judges could entertain a favorable opinion of the Essay is surprising. One, a practical planter all his life, awards the prize to an expensive and almost impracticable mode of cultivation, in preference to other easy and cheap methods proposed. The second, all his life connected with the management of Estates, but better known as a calculating man, approves a mode of cultivation unsupported by calculation, and which will not for a moment stand the test of figures. The third, a scientific and intelligent man, but also himself interested in sugar cultivation, approves an erroneous doctrine in vegetation, and adds his sanction to a retrograde movement, instead of an advance in the science of agriculture. That any one of the judges could entertain a favorable opinion of the Essay is surprising; that the three should unite in awarding the prize to it is most astonishing.

How to account for the fact I can't conceive. Perhaps the competition was considered to be in the terms of a jackass, instead of a horse race, the last to be the winner; in this case the prize is rightly awarded : perhaps, the theme ought to be reversed, and the prize be awarded to the most expensive and most troublesome system of cultivation ; in this case No. 1 stands pre-eminent ; perhaps No. 1 was the first Essay sent in, was numbered 1 accordingly, and through some accident, retained the original number ; in either case the award will not satisfy either the donor or the public. The competitor has, however, received the award, and I think it will prove small enough compensation for the annoyances inflicted on him through his false elevation by the Judges. He is placed in a most unenviable situation ; he has received the award, and worn the honor for a time ; that honor he must now resign. This is disagreeable, but there is no help for it. The Judges, I have no doubt, will apologise for the annoyances they have through mistake rendered him liable to. The other competitors must console themselves with the thought that " the race is not always to the swift, nor the battle to the strong."

In the preparation of land for planting, ploughing, is now the rule, and digging the exception ; all the Essays start fair in this respect, and the comparison to be drawn, must be between the different modes of ploughing, and not between ploughing and digging. The Essay at present under consideration, No. I, starts on the same terms ; the author acknowledges that " the plough is now coming into pretty general use ;" therefore, in noticing his propositions, we must compare them with those in general use where the plough is worked, and not with the old process where the cane holes are still dug. In comparing his proposed practises with those in use, I have no hesitation in saying that his Essay recommends a retrograde instead of an improved system of cultivation.

The chief disadvantages of the mode proposed are the applying the manure by manual labour in the way commonly called ' basket dunging.' Basket-dunging has become almost obsolete ; in nine cases out of ten, the labourers will not perform the job.—Nearly all estates have at the present moment dung-heaps of which they can make no use ; few can get it spread and ploughed in, much less carried in baskets on the peoples' heads. It is the dirtiest work on the estate, and few will now for any money perform it. How then is such a system to be again brought into general use ? The author himself condemns it : he says (page 6) ' this is indeed a tedious, laborious, and expensive operation, but notwithstanding it is the very best plan that can be adopted, and tends ultimately to a very great saving of labour." Having made such an astonishing remark as the latter part of the sentence, and which will naturally surprise those who have given up the practice as a hopeless case, you look forward to some proof of such a statement, but none appears ; surely the author does not expect the public contrary to its own maturely formed opinion, to change its belief without an attempt at proof, but merely on his dictum. The author not having attempted to prove the economy of the application, the public opinion must reject it as untenable.

There can be no mistake in the author's opinion, for he mentions the other mode of applying manure, namely of carting it to the land, then spreading it day by day on the surface, and ploughing it in (page 7) ; but he rejects this economical process in favor of the expensive one of carrying it in baskets on the laborers' heads all the way from the intervals to the middle of the cane pieces.—Is it for this that the Judges have combined to award him the prize !

Again, he says it is preferable to apply manure to the half grown cane rather than in its infaucy, ' as the sugar cane does not so much require to be acted upon by the manure in the first stages of its growth as when it begins to form joints.' This opinion being contrary to experience in all other plants, for the manure is always applied in the infancy of other crops, and by most people also to the cane, the author should have endeavored to prove his position, but this he does not do. What says the scientific Judge to this ? Liebig states that the use of dung is to nourish the plant while young.

The next great error in No. 1, is the manner in which it is proposed to double or more than double the expence of planting.—Having directed the cane holes to be made in the usual way with the plough, the author instructs us that ' the plants are to be placed across the trench, about two feet from each other.' (page 7.)—The word *across* is purposely inserted, for it is repeated afterwards. What the advantages of placing the top across the row are, the author does not attempt to show ; and it may probably puzzle him to give any reason for it ; other people are satisfied to place them long ways of the furrow ; but No. 1, says they are to be across the furrow, and the Judges have sanctioned it, so across the hole they must go. But how to place them across the hole in ploughed land is a puzzler : the hole, which is only a turnip furrow on a larger scale, runs to a point at the bottom ; how then is the plant-top to be laid across the hole ? The only way in which it can be done is by employing labourers to widen the bottom of the hole some fifteen inches with their hoes ; that labour is, of course, all superfluous, and will about double the cost of planting.

The operation of planting as far as we have gone, is bad enough in all conscience, but No. 1, is not yet satisfied; the expense is not yet sufficiently increased; and therefore some other mode of adding to the cost of planting must be found. This, after much research, our author finds to be the best accomplished by ordering the canes to be planted in Quincunxes, a word which I find, on application to my dictionary, means the planting of four trees in the form of a square with one in the centre. Not satisfied with telling us so in writing, he gives us a sketch with his pencil to confirm the writing, and prevent any mistake arising. There must surely be some immense benefit to result from this mode of planting, but which our author keeps secret at present. I presume he let the Judges into the secret, and that he will take out a patent for the invention. I may be accused of being wilfully blind to the advantages to be derived, but at present, I can see no other result to arise than a large increase of expense. Our calculating Judge must have been reckoning backwards when he approved of and sanctioned this economical practice. Only fancy, brother planters, how quickly the operation of planting will proceed when you direct your labourers to plant in *quincunxes*; every man watching his neighbour's row to see that his tops are accurately laid according to the rule of quincunxes; presently some thickheaded fellow will be found to have made a mistake, and up the tops must all come again to remedy it. Is it for this the prize is awarded? I should have thought a patent would have been a better remuneration.—Our planting judge must have been led captive with the brilliant idea of the quincunxes of canes when he awarded the prize to this Essay,

To descend to minor points. Speaking of the preparation of land, he says "the breaking up of the soil with the plough should be performed at the earliest possible period after the canes are taken off" (bottom of page 5.) The land of course is covered with trash and filled with strong cane roots; but these difficulties in the way of the plough he gets rid of in a very summary way; "the work of eradicating roots would be best performed by agrubber, the trash being first got rid of, which would not only tear up the roots, but tend materially to assist the next operation, that of breaking up the soil with the plough." (The sentence runs "the trash being first got rid of by a grubber," but this is evidently the fault of the printer.) Now without waiting to argue why a grubber should dig up the cane roots better than a plough, and which when he comes to try it he will find erroneous, we may surely expect to be told how the trash is to be got rid of. From the way in which he mentions it, it appears so easy that he did not think it necessary to tell us how; he simply says 'the trash being first got rid of,' but 'How?' say the Planters. I presume the author will tell us in the next edition.

In the making of manure, our author directs that "the pens" (not only the compost heaps but the cattle pens) "should be sunk somewhat below the surface of the ground, in order to secure that very important part of manure, the urine, which is otherwise carried away by heavy rains." Here our friend the author appears to forget that one day, almost one hour of the "heavy rains" he describes would make the cow-pen into a duck-pond; and that penning the stock in such a place would, in the course of twelve months, convert his cattle into capital bone manure.—Our Medical Judge can surely have no regard for the lives of the stock if he awarded the prize for this economical method of making bone manure.

Again. "The scum of fermenting cisterns (I presume he means skimming cisterns) in the still-house is a very valuable manure, if mixed with other substances for some time previous to its being applied to the soil, and every planter knows that a still-house affords a large quantity of this during crop." The refuse of skimmings is a most enriching food, and eagerly eaten by stock; it is almost equal to oil cake; then why make it into manure? Stock are not usually over-well fed on Estates.

Rattoon cultivation. Our author proposes a machine for remedying the effect of the bad cutting of canes. He seems to think it a hopeless expectation that the labourers should ever again cut canes well. I cannot at all agree with him that it is such a general fault as to call for the invention of a machine to remedy the defect. I do not think that many parties have now to complain on this score, but if they have, I would recommend his own remedy, (page 2) "the reforming the extremely lax system on which the general affairs of the estate are conducted," where bad cutting is allowed. The people enter freely into the contract for cutting the canes, and ought to be made to do the work well. If the people saw a machine brought for the purpose of rectifying their bad work, it would only confirm them in their bad habit. But putting this view of the case on one side, the machine proposed to effect the purpose is quite impracticable. Other planters are satisfied to attempt one operation at a time; but No. 1 says, if you find it difficult to turn trash by machinery, or to cut down the stumps of your canes, or to mould your rattoons, try the three operations combined, and then it will be quite easy of performance. This reasoning is, I presume, founded on the Rule of Three Inverse, but it is so long since I have practised it, that I am not able to appreciate the force of the argument; I dare say, however, the calculating Judge fully appreciated the beauty and strength of the arguments used in elucidating the problem. "The difficulty (page 9) which has hitherto always attended the working of the hoe-plough, for the purpose of moulding the rattoons, and which has, I believe, in most instances caused its employment for that purpose, to be abandoned, has been the expense attending the removing of the trash, which was necessary to be done to enable the plough to work, and afterwards spreading it back again. To obviate this, I place two light trash boards, &c." Having placed these trash boards, he now thinks that every thing can be accomplished, so to the trash boards he attaches the stump-cutting machine and two moulding ploughs, making altogether four machines. He proceeds "I do not conceive (page 10) there would be the *slightest difficulty* in the construction of it," (the compound machine). "I imagine that not more than six cattle would be required to work it, and it will be managed with *great facility* by the person working it, as the two ploughs will steady each other. Should this compound implement succeed, even in admitting the plough to mould rattoons only, without the necessity for removing the trash, of which, from its *extreme simplicity*, I have no doubt, a very great saving of labour will have ensued, and practical agriculturists must hail its introduction as an improvement of considerable importance."—No doubt so thought the judges, that if the machine could quite easily perform the four operations at once it would be a capital thing. Of course, they will all three immediately have such a machine, made and put in operation: perhaps ere this, as some considerable time has elapsed since they had the benefit of perusing the treatises, they may have had practical proof of the advantages to be derived from its use. If so, they should give us the benefit of their experience. It must have been this labour-economising machine that induced the trio to come to the determination of awarding the prize to No. 1. What a pity it is not likely to succeed. From the experience I have had I should advise the planters to be satisfied with trying to perform one operation at a time.

Further on in the rattoon cultivation, we are told to manure them "once in three or four years;" and how do you think, planters, the operation is to be performed? "The carts (page 11) may work on the cane-piece without injury to the roots, and place the dung in convenient heaps;" he says, "the manure is to be applied to the roots, and this need not be by any means so laborious an affair as that of basket-dunging plants." Not specifying the way in which the manure is to be applied, the inference is, that it is to be by the favorite mode of basket-dunging. Other planters tell us that wains passing over the cane-stoles are injurious, and endeavour to lessen the amount of injury as much as possible; but No. 1 boldly tolds us that we are not only to cart the canes off, but to cart manure on, and that it can be done without injury.

"Under all the circumstances," says the writer, (page 11) "I consider the system of basket-dunging possesses very important advantages over any other, and is the most economical and beneficial mode of applying manure, for the reasons I have adduced, namely:—

"That the urine of animals, when immediately applied to the soil, does not act so beneficially as when fermentation to a certain degree has previously taken place." This reason is equally applicable in the cheaper process of spreading and ploughing in the dung.

"That the sugar-cane does not so much require to be acted on by manure in its first growth, as when it is sufficiently forward to receive the bank." This he does not attempt to prove, though in direct opposition to public opinion. Bryan Edwards, or one of the old writers, accounts for giving the dung with the bank, from planters trying to plant more canes than they had dung ready for, and being therefore obliged, rather than not manure at all, to give it with the bank: this appears to be the probable origin of the custom, and not from any beneficial effect being found to result.

"That the principle of saturating the soil with manure is erroneous, and it is better to apply it moderately, and more frequently."—This may be good advice for those persons who are in the habit of saturating the soil with manure, but I am afraid that few will feel the cap fit.

"That the system of rattooning may, by its means, be carried out to perpetuity." The other Essays propose to effect the same object in a much cheaper way.

"The quantity of manure necessary to be given to the plant being reduced, the labour of applying it will be reduced in the same ratio; the tediousness, laboriousness, and expensiveness of it which are at present the objections to its practise, would be diminished, inasmuch as the necessity for planting would rarely occur." Unfortunately for the author, in page 4, he tells us 'no means ought to be neglected of increasing the quantity of manure on a sugar estate,' and he further tells us how to accomplish this object. He also tells us we are to manure the rattoons as well as the plants.—He can't surely mean to say we are to make the manure and then not to use it. Having made the manure, at a great cost from the different mixings he has directed, he is in honour bound to use it. The only difference there is, is between the cost of basket dunging plants with a large quantity of manure, or basket dunging a larger field of rattoons with the same quantity of dung, only spread over a greater surface. Near the top of page 11 he tells us that the manure for rattoons is to be carted out and thrown in heaps in the field; at the bottom of page 11 he tells us that the manure should be carried out some time previous to its application; it must therefore be placed in the interval, and must be carried as far for rattoons as for plants; and therefore 'the tediousness, laboriousness, and expensiveness' of the operation remain unaltered.

To add one more instance of the economical way in which No. 1 proposes to cultivate the cane, I need only quote the following. ' A system of irrigation might be applied with very great advantage on level estates, where water is to be obtained at no great distance from the surface of the ground' (say two or three hundred feet !) ' by sinking wells and raising the water by breeze pumps.' This may be conceived to be a new way of establishing a sinking fund on each estate. I dare say it would have a very beneficial effect. Probably the Receiver General may draw a hint from this and apply it to the economical management of the Island funds.—Half a dozen wells, with breeze pumps attached, the requisite guttering, &c. say £1000 each :- good investment for capital !

Having noticed so many errors in the plans recommended, it will be sufficient to notice one great error of omission. Our author, curiously enough, has entirely omitted the cultivation of the cane from the time of planting to the time of basket-dunging ; and from that period again up to the time of cutting. What are we planters to think of this ? I presume the Judges thought it the height of economy and awarded the prize accordingly ; but in some parts of the country, at least, there would be a Flemish account of sugar if the plants were not cultivated ; and we planters would like to have been told in plain language whether we were to clean the canes or not.

The part of the Essay treating of the manufacturing process, not properly belonging to the treatise, must be free from criticism.

Against this black catalogue of defects I have in vain searched for opposing merits. In all the Essays I have marked some of the suggestions as better than the usual practise, except in this unfortunate one. It is not my fault. I have looked through it again purposely to find something as a set off, but without success.

I dare say that the author and the Judges have both by this time heard enough of the prize Essay ; it would be too much to expect them to recant on the occasion. I think, however, that leaving the author of No. 1 to enjoy the £100 inflicted on him as a penalty for writing such a bad Essay, the public may proceed to award the honor to the author of the Essay best fulfilling his Excellency's object, namely proposing the easiest and cheapest system of cultivating the cane.

AGRICOLA.

THE PRIZE ESSAYS.

No. 6.

TO THE EDITOR OF THE JAMAICA TIMES.

November 28, 1843.

In my last, we dethroned No. 1; we must now proceed to consider who is the best entitled to succeed to that elevated position, that he may be duly installed by the public in the vacant chair.

Leaving the consideration of the fourth Essay, or the long Essay, or the Mammoth, or whatever other name it is best known by, to the last, we will proceed to consider the others. Of these, No. 6 appears to me to fulfil to the greatest extent, and in the best manner the rules laid down in my last for ascertaining their real merits.

No. 6 is written in a straightforward easy manner, is arranged under the different heads necessary for considering the different branches of the subject, and is supported by calculations of the cost of each practise.

The chief objection I have to it is, that all the directions are made applicable to the model farm, and not to estates generally; but this I conceive to be in appearance more than in reality, for we may suppose that the author lays down what he considers the best practises for the model farm, expecting that we should each adopt them as far as we can. In the commencement he says, he writes this Essay "with the view to save labor, improve and enrich the land, and make large crops from small fields at a very low expenditure." It is but fair, therefore, to suppose that he means us to adopt as much of what he considers the best mode of practise as we advantageously can.

The author commences his remarks with subdividing and draining the land. Draining is a most expensive operation, usually costing more than the full value of the land, and although undoubtedly a most beneficial process, one not at all likely to be carried into effect in this country. The author evidently has never been engaged in the occupation of draining, or he would not make so light of the matter: "the under drains can be dug by machinery, the tiles necessary for draining being made on the spot also by machinery." Machinery certainly can effect great things, and it is very easy to tell us to dig trenches and make tiles by machinery, but it is not quite so easy to put it in practise. This a specimen of the free and easy stile in which several of the Essayists indulge. As nobody is at all likely to sub-drain, it is not worth while to dispute as to the mode of effecting it.

Having drained his land, the author proposes previous to ploughing it, to manure the land either by fly-penning, or by carting out dung, and spreading it on the surface; he proposes also that this manure should immediately be covered with a coat of loam, marl, or lime. This would be an expensive operation, and I do not know where the estates are to get one hundred wainloads of loam for each acre, (the quantity he calculates,) or how the generality of them, if they had the loam, could find means to cart it; I am afraid therefore that this advice will not be applicable to many parties, and that they must be satisfied to plough in the dung without the loam.

The manure being applied, "close-plough the land seven inches deep, following in the same furrow with the subsoil plough, going to 16 inches into the subsoil, or deeper, if possible." This I highly approve of: it is an excellent suggestion: it is one of the practices lately introduced at home, and attended with better effect, than almost any other. The subsoil plough cannot go too deep, but I am afraid that the author expects too much when he directs it to be put nine inches deep below the bottom of the furrow made with the single plough; I think five or six inches would be nearer the mark.

"The land is then to be rolled and harrowed previous to being made into furrows." I have never witnessed the operation of a roller in this country, but can easily conceive that in dry weather it would pulverise the soil better than the harrow.

After making the cane-hole in the usual way, he remarks, "your next duty is to plant the canes, giving them an opportunity of growing in their favorite manner in clusters, or stools, and not in single file along the row. Thin planting appears to be the favorite mode now, only one of the competitors proposing thick planting.

"As you plant, cover the bank and cane bed with cane-trash, dry grass, or any other suitable covering." This our author thinks advisable to prevent the exhalation of the gases, but if the gases are exhaling, they will soon find their way through the cover of trash. He calculates the cost of the operation at nine shillings an acre ; this would only be enough to spread the trash ; it would cost as much more to pick it, besides cartage ; so that I conceive expense will prevent parties from using it. Another consideration is, that it will be seriously in the way during the after cultivation by implements, and therefore I should not recommend it.

“ Cane land so managed will require very little labour in weeding or hoeing, the principal part of such work being performed with suitable light ploughs, drills, harrows, scarificators, and other agricultural implements now in use in the United Kingdom.” This is another specimen of the free and easy way in which some people get over their difficulties. We, the planters, are puzzling ourselves to find out the most advantageous implements to employ ; our friend the author deliberately sits down to write us a code of instructions on the point, and then coolly tells us that the work is to be performed with *suitable* light ploughs, harrows, drills, (query drills for hoeing grass ?) and such other implements as are in common use at home. Although the author jumps over the work so quickly here, further on, in calculating the cost of cultivation, he reckons three hand weedings for the young plants, two mouldings with Biddle's scarifier, and banking with the plough. We should have been better pleased if he had told us what this Biddle's scarifier is, its mode of action, ect. ; without this information we are no wiser than before.

No. 6 proceeds, ‘ the principal part of the ploughing and other field work should be performed by horses, with the assistance of steers occasionally to break stiff land.’ I presume he recommends this chiefly for the model farm, as he elsewhere proposes to employ English laborers on it. Horses would not suit Estates for general use ; but our author seems fully alive to the value of cattle for the plough, as he afterwards states, ‘ Oxen may be so trained, as to perform excellent work without flogging.’ The only advantage I could see in the use of horses would be for horse-hoeing young plants, for which purpose two would suffice. I cannot agree with him, however, that the stock should walk quick when ploughing : I should say two miles an hour for stiff land, and two and a half for free soil, as the greatest speed consistent with good work. Resistance increases as the square of the velocity. A single horse will draw a loaded boat along a canal at the rate of 1 mile per hour, but it will require one hundred horses to draw it at the rate of ten miles an hour. Cobbett says the slower horses work at the plough the better the work. There is however a medium in all things, and stock should never be hurried so as to spread their feet and twist about at their work, which leads to a jerking irregular motion quite inconsistent with good work and the welfare of the stock.

Rattoons should be ploughed—moulded every year, during which operation any of the chemical, or lately discovered manures, may be applied. Or well digested cattle pen or stable manure may be harrowed into the bank so broken, and covered over with the trash taken off when clearing for the plough. 'This may be done by a couple of smart boys (in calculating the cost of cultivation he says four people, which is nearer the mark,) going before the plough, raking the trash on the bank last cut by the plough, and so on in rotation to the end of the piece." Now we can easily conceive that the chemical manures, being strewn by the hand on the surface of the row after the laborers have hauled the trash to cover up the row just finished ploughing, can with great ease be ploughed in; but we can't so easily believe that after the land is ploughed, rotten dung cane be harrowed in; it would be much easier to plough it in the same as the chemicals. The next consideration is, how is the rotten dung to be got on the piece; this the author does not tell us; in the cost of cultivation he reckons "four smart hands fetching manure or compost, to be scattered by the plough, six shillings an acre." This cannot be the calculation for basket-dunging; it would not pay the cartmen for carting it on; neither would it pay for spreading the dung after being carted. I must leave the readers to find out for themselves what is intended here. The subject of manuring ratoons appears to be a great stumbling block to the planters. The author in this instance places himself on the horns of a dilemma; he must either cart the dung on, and cut up the cane stools, or basket-dung the canes at a great expense.

"As the canes are covering the ground, or soon after, the soil may be again disturbed either by a light single one-horse-plough, or horse-hoe, &c." Certainly—plough away—but you have forgotten the trash with which the row was covered after being ploughed, and which won't yet be rotten, although perhaps you may wish it so, having omitted to tell us what to do with it. This trash is a troublesome customer, No. 6, for remember that, further on in your Essay you tell us to cultivate the Mont-blanc cane on account of the large quantity of trash it yields; if it had been the Bourbon you were cultivating, you might by this time probably have managed to plough the refuse of it into the soil. A much more simple plan would have been, to have placed all the trash on each second row, which of itself would nearly keep that row free from grass, and have ploughed and horse-hoed the alternate empty one as often as you liked.

Our author seems to be alive to the benefit done to plants by ploughing near them, for he says, which is quite correct, and ought to be borne in mind, " By cuttng the rooty fibres of the canes that push out in collateral directions, fresh ones immediately replace them, and take up such nourishment as they can find in the newly cut bank; a reinforcement of suckers will be the result, while fresh stability is added to the mother cane."

Passing by the green crops, which appear to be quite the fashion at present, and which are intended to work wonders, though I cannot understand why we should require a series of green crops, seeing that the cane itself is a green crop, and the most luxuriant of all the green crops we are acquainted with, the Essay proceeds to give some of the advantages of sub-soiling. A chapter on manuring, and on green crops follow; and then we come to the consideration of the different kinds of canes.

Our author recommends the cultivation of the Montblanc cane in preference to the Bourbon, on account of its requiring a less amount of cultivation, coming to maturity sooner, yielding more trash for fuel, exhausting the land less, and leaving a larger cover of trash on the land for manure. Most people consider these as great advantages : on the other hand, the Bourbon yields sugar far more abundantly ; our author thinks the Montblanc cane more profitable in the long run. In favor of the Bourbon it may be argued, that in addition to its greater yielding, the fact of its depositing less trash is in favor of the easier application. If it gives less trash for fuel, a much less quantity of canes need be carted and passed through the mill to make a hogshead. As to exhausting the land more, this fact is not yet established. If it require more cultivation, it is no great matter if done by agricultural implements.

Our author suggests that the two varieties might be cultivated on alternate rows, so as to obtain the advantages of both, a plan I should much like to see tried, though I am afraid the Bourbon would be overpowered by the Montblanc cane, which it generally is when they grow promiscuously.

Our author, like a man of business, now sets to work to sum up the cost of all the operations. The only thing I perceive him to have omitted, is the value of the manure for rattoons. I think the cost for making the dung, and spreading it, estimated too low, and I would take out the charge for loam. For close ploughing and subsoiling, half an acre a day is sufficient work; and in cane-hole ploughing an acre a day is easy work. Picking tops for planting is charged much too little, if that is what is meant by " procuring tops of cartman." I would deduct the placing trash on the bank. In other respects, except the application of the manure to the rattoons, and the second removing of the trash on rattoons, the calculations seem very fair, if anything however, they are on the high side, which is better than being too low. The cost of manufacturing is foreign to the purpose of the Essay, as also the general farm expenses.

Having now gone through the Essay, I think I may, on the whole congratulate the author on the way in which he has acquitted himself of his task. If I have been too critical to please the author in some places, it is done for the public good, and that must be my excuse.

AGRICOLA.

THE PRIZE ESSAYS.

No. 2.

TO THE EDITOR OF THE JAMAICA TIMES.

November 30, 1843.

The next treatise we will take under consideration is No 2.—It is short, much too short, we wish it were longer; as it contains much useful information, and from the specimen we have before us, we are inclined to think that the public would have been gainers by it.

" Kago thelontes tos upexugen pono." This is Greek, Hebrew, or Sancrit, to the generality of planters; I can't translate it for them, so, as the Grand Jury said to the Chairman, ' We will thank your honor to translate it.'

The author proposes, as the object of his Essay, ' to offer for public consideration any improvements on the common practises which may appear to combine similar results with a more economical pursuit.' Keeping this object in view he proceeds to suggest several plans for the saving of labour which are self-evidently advantageous, but he should have calculated the cost of the operations, that we might have been able the better to compare them with the proposals of the other competitors.

The author describes the cane soils as divided into heavy clays and light loamy soils; the first he considers the most productive, but the latter as much easier of cultivation. The clay soils he proposes to ameliorate by the admixture of calcareous ingredients or sand, to be spread over the surface and ploughed in. This is very advisable in stiff clays as tending to make them much easier of cultivating them by implements, as tending also to prevent the extremes of dryness and humidity, and from making them more pervious to the influences of the atmosphere and rain, as adding much to the luxuriance of the cane.

With regard to manuring, No. 2 proposes to have standing pens at convenient spots among the cane fields in preference to fly-penning; the pens could then be made more substantial, and prevent the liability of trespass, which is one of the greatest objections to the plan of fly-penning. Another object is keeping the manure altogether in a small space, instead of being spread over a larger surface, thus preventing loss by evaporation, and to a certain extent the washing away of the most valuable parts. One mistake, however, we cannot pass by unnoticed: our author says that the evolution of the gases, and their dispersion through the air will be greatly accelerated by the turning over of the land by the plough. Exactly the reverse action will take place, the gases instead of being dissipated in the atmosphere, will be imbibed by the soil, and retained in chemical combination till extracted by the roots of the plant. Another extraordinary doctrine broached is that by fly-penning, the dung is wasted on the land between the rows, our author evidently thinking that the cane roots do not extend sufficiently into the row to extract nutriment from it. He says, "By this method, (applying the dung in the bottom of the hole,) that part of the ground which is intended to bear the crop is alone manured, the intervals or spaces between the rows not receiving any; from which, where the business of putting the manure into the holes is properly (economically?) performed, a great saving must of course be made." This reasoning is founded on the theory that the cane has no root, or at any rate that it is so short that it will not extend two feet into the row. This opinion is quite unfounded; I should hardly think that it can be necessary to argue that the cane, like every other plant, has a root proportioned to its size; those interested in the matter will however find the point argued at length in the fourth essay, and to which I would refer the author of the present treatise.

Our author acknowledges the greater expense in applying the manure by the system of standing pens; this he proposes to remedy as much as possible either by the use of light one-horse carts, or of wheelbarrows, to go along the trenches and lay the dung at the end of each row. If the trenches were made wide enough, as on some estates, for the passage of a cart, this would be a cheap and easy way of applying the manure for those who prefer applying it in the bottom of the hole at the time of planting, or even with the bank; certainly much cheaper than basket-dunging.

Our author recommends a change of plant tops on estates for the same reasons that it is found advisable in England to change the seed. He does not however direct us as to the distance at which the tops should be placed, on which point we should like to have heard his opinion; but having laid the manure and the tops along the row, he proposes to cover them up by means of a new implement. This he proposes should be a harrow to pulverize the mould on the bank, behind which, if the soil be friable, a couple of moulding boards similar to small ploughs should follow; the intention being to pulverize the soil, and then to throw down as much as would suffice to cover the tops to a requisite depth; in stiff soils the two implements to be worked separately. This is an ingenious idea, and we are glad to see people turning their thoughts to the saving of labour to whatever small amount it may be. The labor of covering the tops with mould in well ploughed land is so trifling that it does not seem to me possible to effect any saving in the amount, I have seen people do it without any hoes, but just throwing down part of the bank with their toes as fast as they laid the tops. I am afraid also, that the harrow would throw down so much earth as to bury the top, the sprouts of which cannot come up if buried too deep. The harrow would form a very good machine for crumbling down the bank, and destroying weeds during the growth of the cane, and to this purpose he proposes subsequently to apply it. I think when he tries his intended machine he will find it advisable to keep the harrow distinct, and to work the small single plough in lieu of the duplicate small ploughs he proposes. It is a great object to have as small a draught as possible, as it is less injurious to the canes to take a horse and a machine four times through them, than to take four horses and a machine once through; in the latter case the canes are sure to be trampled on, in the former they may escape injury.

For the remaining cultivation of the plants, No. 2 does not propose any substitute for manual labour, but proceeds to the consideration of the rattoon cultivation. And here our author has made a most excellent suggestion. He proposes to use a plough for going between the rattoons immediately after the canes are cut, and to obviate the difficulty the trash opposes to its use, he suggests the addition of three semi-circular knives, working in front of the plough to cut up the trash and enable the plough to proceed with its work. This is a capital idea and likely to obviate the difficulty the trash has always presented to the use of agricultural implements; at the same time the turning into the soil such a mass of vegetable matter, instead of allowing it to rot on the surface, and the gases to evaporate, would enrich the soil exceedingly, (although our author says the contrary in a previous part of this Essay) and in fact do away with the necessity of applying any other manure.

A suggestion similar to this appears in No. 5; both plans are feasible, and both authors deserve the thanks of the public for proposing rational methods by which the great obstacle to rattoon cultivation may be overcome.

Our author suggests three simicircular knives for cutting the trash; he does not say how they are to be fixed, but I presume they are to be stationary, and that the lower part of the knife would penetrate the ground, and that the front part of the knife taking a sloping direction forwards would press the trash against the ground, and cut it.—Perhaps a better method would be to have revolving circular knives penetrating about an inch into the ground. I see in a late copy of the *Jamaica Times* an account of a plough with a single knife of this kind attached, having lately been brought successfully into operation. The plan it is self-evident, is sure to succeed. It was tne identical plan I had for some time determined to try, but was prevented from doing so for want of time. Talking over the matter to Cincinnatus, I found he had invented exactly the same plan; so that, as is often the case, several different parties, all about the same period, invented the same machine—Mr. Hutton, of Hanover. appears to be the party to whom is due the credit of having first applied it successfully. If more than one revolving knife be applied, it is probable that a considerable weight must be attached to press the knives through the thick body of trash, and to prevent the tendency they will create of throwing the plough out of the ground. Of course this knife cannot be employed where the land is stony.

No. 2 has made a most capital proposition, but does not appreciate the value of his invention; else why after having shown us how to plough in such a mass of vegetable matter does he tell us subsequently to manure the rattoons. Surely after such an application of manure a further supply is totally unnecessary; and the mode in which he proposes its application is quite inadmissable. He tells us "one horse carts so constructed that on being tilted the load will at once be thrown out, can be most usefully employed to convey the manure into the field, the horse moving up one row between the young canes, and the wheels running in those on either side, so that there will not be any injury to the growing canes, and the manure will be at once deposited on the spot, ready for its application." It looks very well on paper, to see cart and horses traversing through acres of young canes without injury to the canes, but can it be done in practise? and would upsetting a cart load of dung occasionally on the growing canes tend to benefit them?

Some great inconsistencies occur in this part of the treatise.—The author has already told us that we are to plough in the trash on rattoons. Not considering this in the light of manure, and being anxious to make the canes continue to rattoon as long as possible by the occasional application of manure, as he is "convinced from length of experience and careful observation, that sugar may be cultivated at far less expense both of manual labour and pecuniary outlay, and that a far finer description of produce may be manufactured, by this mode than by another at present pursued;" being anxious I say to carry this plan of manuring the rattoons into effect, he turns his attention to the accumulation of manure. "The pens may be put up close alongside the land intended to be manured, so as to avoid carting as much as possible. The heavy trash, after the canes have been cut off, may be easily taken into the steading, and relief be afforded to the land." So, after telling us to plough in the trash, he now tells us to pick it and carry it into the cow pen to make manure. The trash on a fresh cut cane piece weighs some 20 or 30 tons per acre, but the author does not describe the manner in which this operation is to be so easily performed. The trash being supposed to be placed in the pen, of course a large quantity of manure will be made.

Having proceeded to tell us how the manure thus formed is to be carried in one horse carts and applied to the rattoons, he proceeds—"Labourers will be employed at the same time this operation is in progress, to turn the trash off the cane roots, and to hawl round them such a quantity of dung as may be deemed a proper dressing; at the same time covering it with a light mould, or even by replacing the trash over it." Having told us first to plough the trash in; then to cut it off and make manure; he now tells us to employ it as a covering for the dung applied. The author does not at all attempt to reconcile these inconsistencies, which certainly should not occur in an Essay intended to give plain practical instructions. He tells us—"The accumulation of trash, year after year, not only prevents the growth of weeds and grasses, but acts in a most beneficial manner by keeping the roots of the cane moist, &c." Now, is not this condemning his own previous recommendations? At any rate, it would puzzle the reader to find out which is the practise he recommends as best.

I will conclude my remarks on the Essay by quoting his description of renovating the land by penning over the cut canes: it is, as he describes it, "a nice and delicate operation," but one which may be applied to great advantage, particularly in dry districts, and if followed up by the use of the plough and horse hoe.

"Another mode by which the replanting of fields may be partially avoided is that of fly penning on the stools of the canes just as they have been cut off, just so large a portion of canes being cut as the pen will embrace. The cattle are then folded for a few nights on the fresh trash, and the land receives the manure at once without any further trouble or labour.

"This being a nice and delicate operation, its general adoption has been partially forbidden; but in dry weather, and in loose porous soils, it is not without its peculiar uses. It is only during the crop season that this plan can be carried on at all, and in wet weather must be entirely discontinued, as the poaching of the feet of the cattle at that time would destroy all the roots of the canes, and no sprouts would then come up after manuring. A field of canes, having been exhausted for want of manure, may thus, under the circumstances of land and weather described, be recovered for two or three years, and as the labour principally consists in shifting the pens step by step, and punctually over the land, as the canes are cut, the returns will be found not unprofitable for the labour employed.

"When the canes require moulding, little or no difficulty will be experienced in the use of a plough for the purpose, for the trash will have been well trodden down, and fast decomposing. The harrow and plough, already alluded to, may be used for a second cleaning, after which a trashing will be found quite sufficient."

AGRICOLA.

THE PRIZE ESSAYS.

No. 3.

TO THE EDITOR OF THE JAMAICA TIMES.

December 3, 1843.

THE remaining Essays we will take under consideration according to their numbers in the pamphlet, that none of the authors may feel annoyed at being placed last on the list, all their Essays containing some information valuable to the public.

We shall therefore proceed to the consideration of No. 3. The author is "convinced that the West India Planter will derive more immediate benefit from increasing his crops by means of manure than by any new machinery that can be introduced;" he therefore devotes the greater part of his Essay to the consideration of this part of the subject. A very important part of the cane cultivation it is, and well indeed does he handle the subject; indeed of all the Essayists, the present author has given the most luminous and full account of the different kinds of manure; he is evidently well qualified for the subject, and has studied Liebig, but I am not sure that all his deductions from that author are correct.

He apologises for the introduction of a few pages on Immigration, the duties of landlords, and on the manufacturing process, as these do not, properly speaking, come within scope of the Essay.

Speaking of the manufacture of sugar as opposed to the cultivation of the cane, the Governor having offered a prize for the best Essay on the former subject, it should be generally understood where the one operation ceases, and the other commences. Most of the Essayists, and I am myself of the same opinion, seem to consider the cultivation of the cane at an end when it is ready for being cut, and consequently that by a slight straining of the word, the manufacture includes cutting and carting, grinding and boiling, potting the sugar, and making the rum. This is the general meaning on sugar Estates, where it is a very common practise to give some influential headman the job of sugar-making, and which nearly always includes cutting and carting the canes to the mill. The point in dispute is, as to whether cutting and carting should be considered under the one head or the other.—I am inclined to the latter opinion. No 3 has however treated of them in his Essay.—He considers the cutting of the cane by machinery quite out of the question, in which opinion I altogether agree with him, and for the same reasons that he has adduced.

In the mode of cultivation he proposes, there is nothing unusual; it is, as in the other Essays, by making the cane-holes with the plough. However, in this part of the subject, he suggests that the cattle should be worked with collars, instead of yokes. None of the Essays, as far as we have gone having touched on this point, we may consider it here. No 3 says, "we would suggest that the usual mode of working stock with yokes and bows should be superseded by harness, to make the line of draught more powerful by means of *traces*; half the quantity of stock would do for the plough, and the power would be increased in the cattle mills if it were adopted there." This is an assertion which he does not attempt to prove; I cannot understand his reasoning that the use of *traces* should increase the power. It is a question by no means decided by agriculturists at home, that collars are preferable to yokes, each party maintaining strenuously that their own ideas are right. Harness is far more expensive in the first cost than the common yokes, and the wear and tear of it is much greater, particularly in this country. The argument between collar and yoke appears to me to lean rather in favor of the latter, especially if a modification in the use of it, namely the attaching of it close behind the back of the head by a rope to the horns, takes place, in which case the cattle may pull either by the horns or the neck, thus varying the strain. But this also requires further confirmation. I saw in an account of the St. Andrew's Ploughing Match, that a plough drawn by six cattle harnessed competed against ploughs drawn by 10 or 12 cattle; this seems to make in favor of collars; on the other hand, I have seen a plough with six cattle yoked in the common way compete against ploughs worked by ten or twelve stock, so that the question must still be considered as open.

Our author says that he has seen the plough used to split the bank for covering the tops in planting, but prefers doing it with the hoe—in planting, he suggests the Antigua (or Barbados) method in planting a single top nearly upright as being more economical in expence, and as being a mode of planting less liable to be affected by extremes of wet or dry weather. I believe where this practice is adopted, the plough is scarcely used; so that in dry climates like theirs, the insertion of the bottom end of the top deep into the cool ground is likely to be attended with beneficial effects. The holes are dug square with a hoe and then a crowbar is used to make the aperture in the centre of the square for the top to be placed upright in. When the land is ploughed and properly pulverized, scarcely any difficulty will be experienced in establishing the canes, without the soil is of a very poor description, and then of course dung ought to be employed to enrich it. The position in which the top is placed can be a matter of very little importance, the great thing is to guard against thick planting.

The author proposes to mould the canes by running a double plough along the rows, but comes to the conclusion that the other implements used in similar cases in England in the cultivation of growing plants are inapplicable to the cane, an opinion which I hope a perusal of the other treatises will induce him to alter. The remaining cultivation he proposes to be conducted in the usual manner by manual labour; but expresses his opinion that canes are usually far too much trashed, an opinion in which most of the other treatises coincide.

Having shortly followed the author through the cultivation of the cane up to the time of cutting them as plants, as he does not appear to offer any suggestions in rattoon cultivation, further than moulding them with a double plough when the sprouts are old enough to bear the earth being thrown against them, (the cattle being muzzled at the time,) we will revert to the consideration of the great object of his treatise, the different kinds of manure. In this department our author shines with peculiar lustre.

We will commence our review of manures by considering the comparative statement he has drawn of the two methods of manuring by standing and flying pens, and of the advantages and disadvantages of each. He enters more fully into the comparison than any of the other Essayists. He says "It will be seen that, as fodder must be supplied in both cases to the pens, the carriage of the compost to the field where it is to be used, and the spreading of it on the land, are expenses not incurred by fly-penning; consequently the latter mode is preferable on the score of economy. But there is, besides, a strong necessity for its adoption, exclusive of the former altogether, when practicable, for the labourers can scarcely be induced to work at digging and dropping dung by the most extravagant wages."—Having shown then that both economy and facility are in favor of fly-penning, he assumes that the quantity of dung necessarily made about the works by the keeping in of stock for the mill, &c., will be reduced to the smallest possible amount. Being alive to the disadvantages of the system of fly-penning by the loss of the ammonia of the urine by evaporation, he proceeds, subsequently, to consider how this disadvantage can be remedied; so that we may obtain all the advantages of the system, and neutralize the disadvantages. This he proposes to do by sprinkling the land, immediately previously to penning the stock, with either gypsum, sulphuric acid, stokehole ashes or charcoal, for the purpose of imbibing all the urine as fast as dropped, and for uniting chemically with the gases of the decomposing matter as fast as formed. This shows the advantage of chemical knowledge; who would have thought that such an easy and simple application as that of stokehole ashes could have such a beneficial effect?—and yet from the study of chemistry he is enabled to state the fact positively. All estates have plenty of stokehole ashes, but they are usually considered as of no value. Above all the substances he has recommended for use, he prefers charcoal; "this," he says, "is the most profitable, because it is not only the most powerful absorbent of the carbonate of ammonia, but its own qualities, as a fertilizer, are considered by chemists to be quite inexhaustible." This is quite in accordance with my own opinion formed from the study of Liebig, and from what slight chemical knowledge I possess. I consider charcoal destined to become the most valuable of all manures for the cultivation of the cane. I think it will furnish ammonia in sufficient quantity for a luxuriant growth of the cane, and carbon in such large quantities as to facilitate and increase the deposit of sugar. Charcoal and humus (the residuum of decayed vegetable matter) are, according to Liebig, almost analogous in their effects on vegetation. Now we all know what a luxuriant growth of cane and what a large amount of saccharine matter are obtained from canes cultivated in new land. What is it that causes this result? I answer the land being rich in decayed vegetable matter or humus, accumulated during many years. Why may we not therefore expect similar results from the application of charcoal to our fields? I hope these remarks will awaken attention to the subject, for it is a manure we can obtain for the mere cost of manufacture, which is very trifling; and we can obtain it in inexhaustible quantities; it appears also that the good effect of it never lessens or wears out. Our author says he buys it from the bakers at two shillings per barrel.

As we are on the subject of charcoal, we will give the author's succinct account of it. "Charcoal is destined for the future to rank amongst the most valuable manures the planter possesses. Its peculiar property, and the only one that makes it useful in connexion with manures, is its power of absorbing various gases, and yielding them again to moisture. It is proved, beyond all doubt, that pure and fresh burnt charcoal possesses the power of absorbing ninety times its volume of ammoniacal gas and thirty-five times its volume of carbonic acid gas; but this power is much diminished by reducing it to a state of powder. When used for agricultural purposes it should be broken just small enough to allow of its being equally distributed over the surface of the soil. In this state it will absorb any gas with which it may come in contact, and if any manure has been applied containing ammonia in its free state, that is liable to pass off in its gaseous form, the charcoal will absorb it as it rises, and return it again to the plant with the first rain that falls. When, in course of cultivation, the charcoal originally applied is ploughed *under* the surface of the soil, even then it does not lose its power of absorption, but carries on its operations with undiminished energy."

It may be necessary here to apologise to many of my readers, particularly among the old practical planters, for treating on the subject of gases. They will, some of them, be ready to exclaim, what have these gases to do with the cultivation of the cane? I answer, that modern researches, and for which we are more indebted to Liebig than any other, have shown that the nutrition of plants depends entirely on gases, and that carbon and nitrogen form the greater part of the vegetable structure of plants. It is therefore a matter of the greatest importance to consider how we may preserve, in the best and easiest manner for the nutrition of the plant we are cultivating, those gases that usually escape into the atmosphere.

The following remarks of the author on the assimilation of the gases by plants will explain the necessity of attention to the matter pretty clearly to the generality of readers :—

"Cattle pen dung then, in its general meaning, implies a mixture of vegetable matter and animal excrement in a state of decay. During the process, carbon is produced, which, if close to where plants are vegetating, is at once absorbed by them, and assimilated in their growth ; but if this decay is allowed to take place, as it too generally is, where the carbon cannot be assimilated, then such carbon is entirely lost. Animal excrement, urine, for instance, the principal ingredient in cattle pen dung yields nitrogen, and both these substances, the nitrogen and carbon, are of primary importance in the growth of plants. It is, therefore, an important question how both these substances, arising from the decay of animal and vegetable matter, can be produced, so that all shall be saved, and none wasted. If cane tops, grass, or any vegetable matter mixed with animal excrement were applied to the land in its fresh state, and then ploughed in, there can be no doubt but that all the carbon it may contain would be absorbed by the soil, and none lost; but against this it may be fairly stated that the time such matter would require for its decomposition would render its effects, in some measure, useless because the carbon yielded is principally necessary to plants in the early stage of their growth, when a *ra-*

pid supply is requisite.” In opposition to this part of our author's remarks, I would, with deference, ask, whether, upon second consideration, he would not admit, that at the usual high temperatures of our climate, the sufficient fodder usually supplied to the pens, would not undergo a *rapid* fermentation immediately on being covered over by the plough ; more particularly if covered up while still green and succulent ? It appears to me that such an event would immediately ensue, and that our course should be, as soon as the fly pen is removed, immediately to plough in all the vegetable matters, and secure them from exhalation. The other Essays propose feasible plans for accomplishing this object.

Although it will be seen that I contend for applying the manure earlier than our author, as his concluding paragraph contains most valuable information, I will quote the remainder. “The pen dung, stable litter, and other substances to make manure are generally put together in a heap, and exposed to the weather ; the moisture absorbed, causes immediate decomposition, and the heap is observed to be reeking with steam all day. The steam contains the most valuable portion of the heap, and is escaping at an immense sacrifice to the planter. It seems desirable then that dung should be applied to the land when decomposition has fairly commenced, but not proceeded so far as to destroy the vegetable structure.” This is the advice usually given in cold countries, like Great Britain, but I conceive not necessary here, where the opposite fault is more frequent ; bodies usually decomposing before we can manage to apply them. I think, that, after reading our author's treatise on fly penning, no one will attempt to adopt the antediluvian, slavery-concocted, money-sinking, labour-wasting, soul-degrading, system of basket dunging. Our author is deserving of the greatest credit for the clear, simple, and lucid way in which he has treated the subject, and shown the advantages of the methods he has proposed.

We will now proceed to the subject of Guano. The experiments relative to the application of guano by the author are very interesting. In this case the success appears undoubted ; but are the trials sufficient to establish the fact as proved, that it will be found beneficial in every case ? I contend they are not. —The author and I have been studying the same volume, Liebig ; I contend that the animal manures will be found injurious to the cane in so far as they tend to make the cane over-luxuriant, and form molasses ; No. 3, on the other hand, contends, in his article on urine, the most powerful of animal manures, that “ a high degree of culture requires an increased supply of manure ; and that, with the abundance of manure, the produce in sugar will augment, but must diminish with its deficiency." It will thus be seen that we take very opposite views on the question; I think it likely, however, that we may both to a certain extent be right; he may be speaking of poorer and drier soils, and I of the richer and moister. Exactly the same argument holds good in the application of guano, which is a most powerful animal manure. The author admits that " the soil (where he tried the experiment) is light small shot or manganese, the poorest we have. " And this is what I am ready to admit, that on poor soils and in dry situations, it may be advisable to apply the guano to induce a luxuriant growth of cane; the same quantity applied, I contend, to rich land or in a moist climate, would make the cane perfectly rank, and form molasses instead of sugar. That in the instance of the author it was beneficial appears certain, and it should therefore have a fair trial in other cases. I trust the author will, for the public good, after having perused my remarks, give us the benefit of his future study of the subject. That this manure affords the proprietor a chance of obtaining three crops in two years on poor soils, will be, to every one interested in the soil, a sufficient reason for carefully studying this part of our author's Essay. In future experiments the effect of the stokehole ashes, however, being themselves a powerful manure, should be naturally calculated.

When treating on the cultivation of the cane, I purposely omitted noticing the method in which our author intended to apply both guano and liquid manure by means of carts to the growing canes. This cannot be attempted; it would be ruination to the canes; the public highways are scarcely wide enough for our carters to drive along, much less then, if the wheels were confined to the circumscribed space of four feet, would they be able to work without doing damage. But if such a small quantity of guano is necessary, and if it is found on experience that it is better to apply it to the canes when growing, there cannot be much expense or trouble in sowing it by hand, broadcast; or a man might have a small hand-drilling machine, such as is used for beans at home, to drill a small quantity on each side of the cane bank.

Our author's suggestion on the collection of urine will long remain a dead letter in this country. Requiescat in pace.

I am surprised to find, when treating of urine, that our author asserts that the cane requires a greater supply of nitrogen than when the crop is changed, as the excrements deposited by the cane will not be re-absorbed. Our author proposed to plough between the rattoons; that ploughing, by exposing those excrements to the action of the air, will reconvert them into nutritive matter, and cause their re-assimilation by the plant.

F F

I must now take leave of No. 3, and on behalf of the public return him our thanks for his excellent Essay on manures.

AGRICOLA.

THE PRIZE ESSAYS.

No. 5

TO THE EDITOR OF THE JAMAICA TIMES.

Feoruary, 1844,

Unavoidable circumstances have lately prevented my continuing my criticisms on the Prize Essays, for which I must claim your indulgence. The subject is of too great importance, however, to have lost much of its interest, I therefore resume my pen.

The first, sixth, second, and third Essays have already passed under review : leaving the fourth until the last, as contemplated, I now proceed to the fifth.

" The harvest truly is plenteous, but the labourers are few." This is an immigration text, and not one adapted for an Agricultural Essay intended to diminish the use of manual labour; and the author having started on an immigration text, devotes a great part of his Essay to immigration. In reviewing the other Essays I neglected to criticise any remarks relative to immigration as superfluous ; but the author having devoted so much of his Essay to the subject, it must be presumed that he thinks it a matter of paramount importance, and that, although he does not expressly declare so, it will prove more economical and profitable for the estates to import additional labourers, and to continue the system of manual labour, than to endeavour to obtain a greater product from the labour of the present population by the use of agricultural implements. The prize being proposed for the most economical cultivation of the cane, it would be difficult to put any other construction on the author's intention.

As the author has bestowed so much attention on the subject, it would be well in this case, although I have not done so in the other Essays, to review the subject for the purpose of comparing the relative value of immigrants and agricultural implements, in regard to economy.

The cost of importing an agricultural labourer is about £10; the cost of a large plough, a small one, a harrow, and a horse-hoe, being all the implements necessary for the cultivation of the cane, is about £20; so that the cost of the importation of a set of agricultural implements is about equal to that of two labourers. The wages of the ploughman and the two or three boys necessary to work the implements are equal to the wages of three immigrants; but the ploughman and his boys will cultivate from five to six times the quantity of land cultivated by manual labour by the three immigrants; a plough being capable of cultivating from forty to sixty acres of land, and three men by manual labor not more than nine or ten acres; or, the value of the plough is to immigrant labor, in point of economy, as about three to one. No notice is taken of the purchase of stock for the plough, as estates would have plenty of stock for the work if more attention were paid to the feeding of them. The introduction of the plough throws three field labourers into the labour-market for each £10 expended, but each immigrant only one. It is therefore more advisable, as a speculation, to turn our attention to the general use of agricultural implements than to the introduction of immigrants.

That immigrants may be introduced with great advantage both to themselves and the island, there can be no doubt. The introduction of them will not materially cause a reduction of wages, because, as introduced, fresh land, of which there is an immense quantity, and the old lands which have been thrown out of cultivation for some years, and which by the activity of tropical vegetation have become renovated, will again be gradually brought into cultivation. But even supposing that such were not the case, as long as the labourers can purchase land in any quantity they please, and almost at any price, they will retire from labour, and cultivate their own tenements rather than labour at what they think an unfair price. Let the proprietors then turn their chief attention to improved systems of cultivation, and let the friends of the poor and needy labourer assist him to come to a land, we may, almost without impiety, say flowing with milk and honey, and where labour will meet with its sure reward.

The author of No. 5 proposes that "a legion of labourers b located in each parish of the island." Six thousand soldiers con stituted a Roman legion. Six thousand able labourers for the use of the sugar estates in each parish, is rather a startling proposition. At a cost of £10 a-head the capital required would be £60,000 for each parish. What's to be done with them when they come?—They are to be "embodied and disciplined like soldiers, and are to be available to the managers of the estates in the numbers and at the times they may require them, but worked and ordered by their own officers." Now supposing there are sixty estates in each parish, which is more than an average, this would give each the use of one company of one hundred men, to be kept at regular work, and I suppose, to be marched to the cane pieces at the sound of the drum and fife, and to weed or trash the canes as may be required. But how could the overseer find work for such a number of them, even if he were to revert to the old fashion of digging all his cane-holes? And would the work be done better or cheaper than at present?

Another question might be put to our author; he tells us, further on in the Essay, "that a labourer in Canada, the veriest dolt, will be caught at and hired at *four shillings per day*, with better food than a manager can now procure in Jamaica." Then why should not the immigrants proceed to Canada, a climate more congenial to the generality of them, and when such tempting offers are held out to them, in preference to coming here, where we can only offer them from a shilling to eighteen pence wages a-day?

Having touched on the question of immigration, I must pass over a few pages he devotes to a reduction of the sugar duties, the post-office arrangements, and the manufacturing process, and confine my remarks to the field work.

Strange to say, immediately after having recommended the introduction of such large numbers of immigrants, he opens the practical part of his Essay by telling us that the less the cane is cultivated the better. Rather strange this, but here are his words, "The impossibility of procuring manual labour to the extent formerly at command has compelled a part of the canefield, in some districts, to be neglected from the time of cutting for one crop till cut for the next; and when so situated as to be safe from trespass, and pretty clear of vermin, the cane has generally made a *better return* than when previously cultivated with *great care*." The proof of this he shows from a case under his own knowledge. But if the cane is injured by cultivation,—if nothing is necessary for its welfare but to keep it free from trespass,—for what purpose are the legion of immigrant laborers necessary? Surely the present population must be superabundant,—more especially as he afterwards ells us that all hilly estates should be given up, and only the level or easy-lying estates continued in cultivation. "Unless a sugar estate is favorably situated, I consider, in the present state of Jamaica, that it is injurious to all, but more particularly to the proprietors of the hilly estates, to continue in the hopeless competition with their more fortunate neighbours."

Again, with regard to the uselessness of cultivation, hear what our author says, "Let me enquire what planter ten years since would believe, that on a worn Jamaica estate, a sugar crop could be produced without, (comparatively speaking) either using the hoe, manuring, or trashing the canefield; I suspect he would consider the person asserting this either little less than a fool, or a madman; yet *facts* are coming to light every day, which cannot be received otherwise than as an approximation to so desirable a result. For instance an extensive field of plants were put in with the plough without manure; but the means failing, they never were banked; when ripe, the canes were cut off, the trash burnt, and the bank given in a very rough way with the plough; without more attention, the first rattoons, when ripe, were cut, and proved a much heavier crop than the plants; the trash was again burnt; (from want of means of removing it,) and the soil again loosened about the roots with the plough, which divided many of the stools, but the second rattoons proved quite as good as the first; and the same system pursued, the third rattoons are, in appearance, superior to any of that class on the estate: these facts lead to the conclusion, that if, in putting in the canes, care be taken to eradicate the weeds, so that the cane alone covers the ground, trashing, in all cases, and other cultivation after it is four or five months old, may be advantageously dispensed with."

And again, with reference to trashing, he says, "This, it will be observed, has been, after all, the great source of extravagance in the system of cultivation, as we have been in the habit of hoeing through plants every month, and rattoons every second month, or more; this extravagance, with free labour, could not be persisted in; consequently we now find it very generally reduced, even to one half the number, or less; where this plan has been pursued, even the Bourbon cane is not less productive, and the other descriptions, from their hardier nature, suffer even less; this is, I think, a proof of the enormous waste of labour during slavery."

This example our author gives of the small amount of cultivation necessary for the welfare of the cane does not agree very well with another statement he makes. "It cannot be doubted but the constant luxuriant vegetation with which Jamaica is blest, enormously increases the expense of cultivation, and more particularly with the sugar cane as hitherto conducted." Now, as the grass does not appear to have grown in the instance he mentions, when the only cultivation the canes received was by burning off the trash and running the plough once through them; and as, in the old system of cultivation, he says the canes required to be cleaned at least every two months, if not every month; the inference is that the oftener the cane is cleaned, the faster the weeds grow. For my part, although I agree with him that trashing canes is nearly unnecessary, I must say that I think the cane can scarcely be cleaned too often when young; that the oftener it is cleaned the better chance there is of entirely extirpating the weeds from the soil; and that when the trash is burned off, the ashes stimulate the weeds to grow as luxuriantly as the canes, and that therefore canes burnt off require more instead of less cultivation; and, I dare say, that my readers will agree with me in these points.

The author suggests the cultivation of green crops to enrich the land previous to being put into canes, and for the purpose of feeding the stock with a more nourishing food. That when the green crop is fit for cutting the cattle should be constantly penned on it to make them more gentle and docile, and to tread down the refuse matter, which is to be immediately ploughed in, and the land planted in canes. Now, if green crops are so planted for the purpose of feeding stock, this way of penning the stock over the green crop is the most extravagant way of making use of it; the fodder should be cut and put into racks, else the cattle will destroy nine parts of it for one that they eat.—Again, under our present system, the cattle may be constantly penned, may be well fed, and made docile by penning them on a piece of growing canes, or by carrying food to them without planting any new green crop purposely for them. The author should therefore have shown that there was an advantage in planting lucern or clover rather than in feeding the stock with canetops or Guinea grass as at present. Will an acre of lucern or clover give a larger amount of nutritive food than an acre of canes or Guinea grass? And is it cultivated at a less cost, and with more certainty? This, which is the most essential part, he does not attempt to show, and this is the point which it is most necessary to clear up. It is quite the fashion to recommend a change of crops and green crops, but nobody has, as yet, in my opinion, proved that there is any benefit to be derived from them. I hope to be able, on a future and more convenient occation, to enter fully into the consideration of "the green crop question."

Our author makes a capital suggestion in this part of his Essay. He recommends that as a preparation for the green crop, "as soon "as the cane piece was cut and cleared of the canes, the refuse "should be chopped into small pieces by the operation of a *patent* “*sward cutter*, and be ploughed in.” This is one of the best suggestions contained in any of the Essays; it offers a feasible and easy method of accomplishing that great desideratum, the ploughing into the soil of the trash in rattoon cultivation, and which operation would make the cane rattoon *for ever*, as the saying is. This operation he recommends as the preparation for the green crop; of course it would be equally applicable as a preparation for a cane crop. He subsequently strongly recommends its use amongst rattoons, and as our author's suggestion of the trash-cutter is very valuable, and as his argument on the advantage of the application of the refuse trash is convincing, I will quote his account of it for the benefit of those interested in the matter. “There is one thing thing more, however, affecting the cultivation of rattoons that I should wish to enlarge on a little; it is the removal of that great obstacle to cultivating them with implements, viz., the field trash; covering every new cut cane-field, like a thick mat, composed of cane tops, rotten canes, weeds, and cane leaves, it is impossible any implement can penetrate the soil until it be divided or removed; if, as is a general practice, it is drawn by manual labour into the first furrow ploughed, so as to leave the next row clear for the plough to proceed, and so on, continuously, it must obviously be a very expensive operation; and again, if burned or removed entirely off the land, it deprives it of one of its best restoratives, and most natural manures.”

Our author appears to have quite lost sight of the cheap and easy system of non-cultivation that he so strongly recommended, and as he does not tell his readers which he would advise them to pursue, let me recommend them to adopt the present plan of ploughing in all the trash, instead of the burn off—and plough-once system. But to return to the subject again.

“To obviate these disadvantages, and render its mixture with the soil at once cheap and effectual, and also to prevent its opposing one great object, the introduction of agricultural implements, I have considered the patent sward cutter, used by the English farmers, and described with a plate in the first volume of the Encyclopædia Britannica, in the article “agricultural implements,” to be particularly appropriate. As its name implies, it is used to cut tough swards or old pasture lands, so as to render them ploughable; and, in the case before us, I consider that it would cut into pieces, not exceeding six inches in length, the whole of the trash, long tops, and every other succulent substance subjected to its operation; and, as it could be applied, as fast as the canes are removed, and *followed immediately* by the cultivator or light plough, the greater portion of these substances would be at once *intermixed*, and covered with the soil, before the influence of the sun could materially deteriorate from their value, as a *green crop*.”

It appears most surprising to me, that our author, having found out such an excellent system of cultivation, and one so simple and easy, did not at once proceed to draw the natural inference from the consideration of these facts. Did it not occur to him that having discovered the means of ploughing in the trash with facility, it enabled him to make his soil inexhaustibly rich by annually repeating the operation of the machine? If he had calculated, he would have found the thick mat, as he calls it, of vegetable matter actually amounts to more than what is generally given to plants as manure, and that if this mass were annually applied, the cane should increase instead of decrease in luxuriance. That, even if he wished to plant the canes, his proposed system was quite sufficient without any other manuring; and that therefore the cattle might always be turned out to pasture, which would both keep them in good condition and prevent trespass. Such are the natural conclusions to be drawn, but such do not appear to have suggested themselves to our author, else he would have thrown overboard all the rest of his Essay, and have rested his fame on this one point alone.

But to proceed with his argument in favor of the practice. "From the conclusions of the ablest writers on organic chemistry, we are led to believe that the best nutriment we can offer to any plant, is the decayed portions of itself; as the prunings of vines, intermixed with the soil about their roots, produce a remarkable improvement in the bearing appearance of the vines, from which they have been cut. On this principle, the method here pointed out, of introducing the refuse of the cane, *while yet in a succulent state*, beneath the surface of the earth, which is to nurture the expected crop of rattoons, cannot but be attended with very decided advantage, besides so effectually removing so great a barrier to the application of agricultural implements as the field trash has ever proved. Respecting the machine, it is remarked, that our sward-cutter will cut as much land in one day as six ploughs will plough; any common wright or smith can make the instrument; it is very strong, very simple, easily managed, and moved from place to place, and, if put under cover when not in use, will last many years. It was invented by the honorable Robert Sandilands, and costs from five to six pounds; the machine might also be used with much advantage on rough ploughed lands, as it would cut all the clods to a uniform size with certainty, and far more expedition than a harrow, but if it only accomplished the one purpose, that of mincing up the refuse left on a newly cut cane field, it will be a very great acquisition indeed. On inspection of the plate, at the reference I have mentioned, it will be seen that the machine admits of a simple and efficient plan for the arrangement of the cutters, so that they may be arranged to cut either close to each other, or at any distance best suited to the operation intended. This application of the refuse of the cane, it must be evident, would be far more efficient and less expensive than any yet brought into practice, and wouldr obviate all the various expensive methods now resorted to to improve the rattoons, by applying manure to the canetsool or root, by means of folding the stock on the cane field afte cutting, or giving baskets of dung to the stool, from which the earth has been removed by the hoe; this is both tedious and laborious and consequently expensive, and if not followed by rain, will have a contrary effect to that intended, and as to folding the stock, though cheaper and more expeditious, the treading of the stock hardening the soil must be prejudicial, and as they can be permitted to remain but a short time without injury to the young cane shoot, it cannot be considered as very efficacious, besides the trash remains as great an obstacle as ever to the tilling of the land."

In considering the machine recommended for repairing land for green crops we have been drawn away into the consideration of the use of the same implement for rattoon cultivation, and have therefore, in a manner, put the cart before the horse; we must now return to an earlier branch of the subject, and we will take the Essay in as regular a manner as the irregular method of the writer will admit. Our author calculates £3 as the expense of ploughing an acre of land; he must be rather out of his calculation, as the seventh Essay only reckons one pound ten shillings for the whole expense of ploughing, planting, and cultivating an acre of land.

His remarks as to rendering the cattle more docile are worth transcribing, as it is a point of duty in which our labourers are very remiss, and which requires the constant superintendence of the master's eye. "Who has not observed the kindlier and more efficient working of the stock in colder countries? This is altogether attributable to their more constant association with man, and their dependence on him for that nourishment and care their education renders necessary. Horses coming from England and America are much more gentle, more docile, better broken, and more perfectly trained to their work, yet they are not *naturally* a superior race in any respect to the native horses; but then the latter are not half trained: how can they be, if they be allowed, as they generally are, to go at large in search of food? And the same is the case with our oxen. In Upper Canada I have seen the labourer, without rope, whip, or other implement, having called by name a pair of oxen from a field where they were grazing, followed by them; and without trouble or loss of time they submitted their necks to the yoke and commenced an arduous day's work which they continued almost without coercion until turned out to feed in the field at nightfall ; at midday being fed in the stable like horses, while the labourer took his dinner. Unlike our stock, they are carefully trained to their work, and their association with man is not a season of *constant correction* and torture, on the contrary, they feel their dependence on his care for their daily food, and obey his will with all their strength."

As to the kind of cane to be cultivated, our author leaves the reader to judge for himself according to circumstances. " He is inclined to think that where a cane-field can be kept carefully cultivated, the white cane or Bourbon will be more productive, if the soil is stiff, cold, and not easily exhausted." In other cases he recommends the Montblanc or blue, which he says " will be found most beneficial on light gravelly soils, on hilly lands, and particularly where levels are subject to burn ;" he says that it requires less cultivation, rattoons longer, and makes fairer sugar; but this last remark I think doubtful. He thinks that all canes degenerate into the ribbon cane, which he considers the worst of all. This I can by no means admit ; as well might whites degenerate into blacks, or blacks into whites. The disappearance of the better descriptions of canes when planted together with the inferior ones is easily accounted for ; the ribbon cane, and the purple and black canes which are worse than the ribbon, will overpower and destroy the better descriptions of canes planted along with them, and will grow after the others have died away.

No. 5, having ploughed his caneholes and discussed the best varieties of canes for cultivation, proceeds to direct that the tops should be planted as thick as possible ; " it will be perceived therefore that I am an advocate for thick planting, thicker than in the olden time." He proceeds to contend against some ingenious arguments he had lately seen proposed in favour of wide planting, and argues that wide rows are quite inadmissable as " the cane root can extract nourishment *only from a very limited extent* of the soil immediately surrounding it, as its heavy top and luxuriant foliage have been evidently intended by nature to afford it the means of of drawing its principle nutriment from the atmosphere and *not from the soil.*" All plants derive their chief nourishment from the air and therefore should have no more occasion for a root than the cane, yet we see that they all have roots and large ones too, if we only search sufficiently carefully for them to get them up without breaking them. If No. 5 will remove the trash between the rows jocanes carefully, he will find among the rotten trash on the surface of the ground, the roots extending their ramifications in all directions. Or, if he will repeat an experiment that I tried by planting two tops under similar circumstances, only the one sunk in a box giving the root only six, eight, or twelve inches room (whichever he thinks the full extent of the roots\ to expand in each direction; and the other top with plenty of room to expand its roots; he will find the one to be, at the end of twelve months, a large canestool with fifteen or twenty ripe canes; the other to be a pigmy, with a few spindling shoots, with perhaps half a dozen joints of cane on each.

As a proof of the shortness of cane roots, our author proceeds to state that "Fields well manured, after having produced the usual quantity of rattoons, on being again dug, have gone on producing another routine of crops the simple precaution being taken in the second holing to make the *old bank* into the *new hole*, if the land admitted of the cane row running only in the same direction; but in other cases the *new* cane holes being dug at *right angles* with the old has produced the same effect of giving the new crop all the benefit of a *fresh soil*, clearly proving that the old cane root had extracted the nourishment it required only from a *very limited extent of the soil*, and that all the virtue of the manure remained *unappropriated* in the old bank, though at most but *a few weeks* removed from where the cane root stood." This is one of the old dogmas which I never expected to see again in print, and I think the best way to decide the matter is to put the author's practice against his theory. For having argued to his heart's content against the wide planting, and having summed up in these words: "From these reflections I am much inclined to think that by assimilating our management of the cane field to the system of drill husbandry, so generally approved of by English agriculturists, and covering the land almost entirely with cane, leaving only small spaces between the rows, &c." Reader, after all this argument against wide rows, our author tells us, when treating of the mode of planting the top, "the cane rows being opened with the plough, say *four and a half or five feet* apart." I certainly expected his directions to be from *two and a half to three feet*, but no, he says plainly, from four and a half to five feet; why, that is actually wider than usual.

Although our author would insinuate at the beginning of his Essay that the less the cane was cultivated the better, he now informs us that "four or five weeks after planting, a small light harrow, drawn by two cattle, is to be kept at work to dig out the weeds and give the bank." He says it will clean with ease three or four acres a-day, but he does not say what will be the cost of working it, or how often it will be requisite, though he subsequently casually mentions the plants receiving two or three weedings, besides banking. So that we see, our author determines upon second thoughts not to trust altogether to the kindness of Dame Nature for the cultivation of the cane.

Having already, when describing the sward cutter, given his proposed plan of rattoon cultivation, which is very excellent, it is unnecessary to say more on rattoons here, further than to quote the following passage in opposition to where he says that the cane roots do not extract nourishment out of the bank. "The agitation of the soil between the cane rows is of great service in presenting fresh nutriment to the roots, to be imbibed and assimilated by the plants as they advance to perfection.

With regard to trashing, No. 5 appears to give it up in rattoons altogether, and to recommend trashing plants only once, or at most twice for the lodged canes to lie upon. He says that on the banks of the Mississippi, trashing is never heard of, that no animal of any size could force its way through the cane patches, and that, out of them, without a compass, it would be impossible for a man to get." The growth of the cane must therefore be awfully luxuriant, for our author sums up by saying, "and yet forty, sixty, and seventy tierces per *week*, is not more than ordinary *work* for an estate." This is an Irish way of drawing a conclusion ; I can't conceive what he means, without it is that forty, sixty, or even seventy tierces per *acre* is not more than ordinary *yielding*. This certainly is splendid yielding, even from such a forest of canes as he has described. It beats my improved breed of bamboo canes that my friends said were to be planted one hundred feet apart, and to give ten hogsheads an acre !

Our author having gone through his system of field cultivation, advances to the consideration of the carriage of the canes to the mill, and the manufacturing of the produce. The former might legitimately come under consideration, as the success of the rattoons depends much on the carriage of the canes off the cane-piece, without injury to the stools, but it belongs more properly to the manufacturing department, and as the other Essays have not touched on the subject, it is better for it to form part of the subsequent treatise on sugar boiling.

In the conclusion of his Essay, the author asks a question which deserves a reply, as it throws a slur upon Liebig's reputation ; he says—"But to show that one fact may seriously affect a volume of theory, I would state, that from a certain cane-field on Low Layton estate, in St. Georges, some years ago, on which the cattle had been habitually penned for years, a quantity of sugar, exceeding ninety cwt. per acre, was produced ; the fact being incontestible, how are we to reconcile it with Liebig's analysis and theory of assimilation ?" On Liebig's behalf, I should answer, that the cattle having been penned on the land for years, the whole, or nearly the whole of the nitrogen had evaporated from the long exposure ; that the inorganic parts of the cattle's manure had accumulated in such quantities as to supply the place of those carried away during many previous crops, and probably making it better than even virgin soil ; that, therefore, the combination of a favorable season and good cultivation completed the job. Virgin land is occasionally known, under favorable circumstances, to give such large yielding, and the above explanation appears to me satisfactory, and I hope will prove so to my readers.

Before concluding, I would make a few remarks on a subject, casually alluded to in this Essay, and not in any of the others ; I allude to the practice, in cutting canes, of leaving the suckers to grow for the succeeding crop. The author says that such is the case in Cuba. It is the manner in which the laborers cut the canes in their gardens. It is a practice which has always appeared to me to be proper and very desirable, but which I thought could not be done on a large scale. Since writing my Essay, I have seen with much pleasure a field, the half of which was treated in this way, the other half being cut as usual. It was tried by Mr. Blount, at Wheelerfield, and when I saw it at eight months old, the half in which the suckers had been left was two or three months more forward than the other part, and was fit for the bill ; the canes also looked larger than in the other part, and, as far as I could judge, the experiment was attended with perfect success. In cutting the canes, a few dollars extra were given to the people to carry them out to the trenches where the wains could get them without passing over the sprouts left growing. It is a plan that has been, I am informed, for some years pursued by Mr. Johnston, of Anchovy Valley, with success, particularly in swampy pieces. Canepieces cut in this way looked ragged and unplanterlike, but looks are of very little importance, if the canes are more luxuriant, and brought forward earlier to maturity. It is particularly advisable in swampy lands, where the cane stools are very apt to die after being cut ;—the suckers then carry on the circulation of the sap, and prevent the stool from being chilled and destroyed.

AGRICOLA.

THE PRIZE ESSAYS

Nos. 7 AND 8.

March, 1844.

TO THE EDITOR OF THE JAMAICA TIMES.

These may be called, by way of specification, the two short Essays. They are much too short to have stood a fair chance of winning the prize, as it was impossible in such a small compass, to treat of all the branches of the subject. They are, however, not without their use, as they contain much that is good.

The seventh is chiefly valuable as containing a statement of the cheapest system of cane cultivation that has hitherto been laid before the public as actually put in practice. As it is the record of a fact, I conceive it is very valuable, as showing at what a small expense the cane may be cultivated if proper attention be bestowed on the subject. What one man has done another may do if he tries, and although the estate mentioned, Norbrook, is more favorably circumstanced by having a lighter description of soil to deal with, and a lower rate of wages to pay, than many parts of the island, yet still the expense of cultivation is so very small compared with the usual cost of cane cultivation that the question must naturally be brought home to every man's breast, whether the system he is at present pursuing is not far more costly than necessary. This certainly will be the question asked by those at whose cost the cane is at present cultivated; it therefore behoves those who are the cultivators of the soil either to follow the example as far as possible, or to be prepared with a satisfactory reason for not taking advantage of so obvious a benefit. A great many will read the statement and say, " Oh, it's all nonsense, it can't be done for that money." This apology for an argument won't do; the statement is brought forward as a fact, and we have no right to doubt the correctness of it.

As many parties may have forgotten the statement, and as others may never have seen it, I will repeat it for their information.

	£	s.	d.
FALLOW PLOUGHING, ONE ACRE A DAY.			
Ploughman's wages 2s.—two boys at 1s. 3d.—one boy at 1s.—cost per acre		5	6
HARROWING THREE ACRES A DAY.			
One man 2s.—one boy 1s. Cost per acre		1	0
PLOUGHING CANE HOLES, TWO ACRES A DAY.			
Hands as in fallow ploughing		2	9
PLANTING.			
(This estimate is much too high if thin planting were adopted, but is very fair for the usual mode of doing it.)		12	0
HORSE HOEING, TWO ACRES A DAY.			
One man 2s.—two boys at 1s. 3d Cost per acre 2s. 3d.			
Three times		6	9
Banking with a small plough, same hands		2	3
Total cost per acre	£1	10	3

The cost of manuring is not reckoned, having nothing to do with the cost of cultivation by implements as compared with that of manual labour.

The system of cultivation adopted is very good for the locality of the estate named. Estates situated in richer or moister districts might require more frequent cleanings, but would also give comparatively larger returns, so that the cost of cultivation would not bear a larger proportion to the value of the produce.

The only points apparently in which objections may be raised in this system of cultivation are, whether a small amount of hand weeding might not be necessary amongst the young sprouts whilst very young ; and also as to the necessity of trashing the canes.—The first would depend much on the preparation of the soil before planting : if the previous preparation had destroyed all weeds, it might be unnecessary. In my own Essay, wishing to be on the safe side, I have calculated upon hand weeding during their early growth between the sprouts where the implements cannot reach.—On the other point, regarding trashing : in such dry situations as Liguanea, I consider trashing not only unnecessary but injurious, it is therefore very properly omitted in the calculation. Parties living in wet climates must accordingly allow what sum they may think necessary for that purpose.

Two cattle, tandem fashion, and muzzled, are used for working the horse-hoe, or hoe-harrow, as more commonly called here. The Essay states that only one cattle had been lost in the course of thirty months on the estate, a fact which speaks well in favor of both manager and labourers, and shows that a loss of stock is not a necessary consequence of the use of the plough.

I cannot refrain from recording my tribute of praise both to Mr. Gordon and Mr. Edie, for having been the first to bring the use of implements in cane cultivation to a successful result. These parties, although not the first to introduce implements for cane cultivation may certainly claim the honor, and a great honor undoubtedly it is, of having been the first to complete the cultivation of the cane without other manual labour than that necessary to plant the tops, and work the implements.

It may be much doubted whether even their success would have been sufficient to rouse public attention to the fact, if the St. Andrew's Society had not unremittingly drawn attention to the circumstance. This shows of how great advantage to the community generally these societies may prove, and it should be a further inducement to all parties interested in the general prosperity of the country to give them their utmost support.

The Eighth Essay is by a disciple of Tull, and therefore argues strongly in favor of the pulverisation of the soil. This point I have so often insisted upon, that it is perhaps hardly necessary to do so again. A proprietor in one of the smaller Islands, much subject to dry weather, in writing to a friend in this country, after speaking loudly of the successful results that have attended the use of the plough, both in increasing the return of produce, and in making the young plants stand without injury, the effects of long dry weather, sums up in these remarkable words, which fully show his estimate of the advantage of it, "In fact, without pulverization, we can do nothing."

In speaking of ploughs, there are two statements of our author, which I object to. First, he says—"The nature of the land will immediately point out to a person which is the plough best suited to his purpose." How can this be, seeing that the most skilful agriculturists in the mother country have not yet come to a decision on the point? Again he says that, in making cane-holes, "the double-mould plough is undoubtedly the best, as it accomplishes, by one operation, what the single one does by two, and consequently reduces the labour one half." If the double-plough only went once through the land to form the hole, it might be said to reduce the manual labour one half, but if made to go deep enough at one operation to form the hole, the draught is double that of a single plough, and is most distressing to the stock; it is therefore generally put twice through the row, the second time going deeper than the first, and also remedying any crookedness in forming the first row; the labour therefore would not be less than by making the hole with the single plough, which appears to me much preferable.

No 8 says that if the land is properly pulverised before planting no hand-weeding will be necessary, and that the weeds will not make their appearance until the canes are high enough to admit of the use of implements for weeding, and which he proposes to do with the hoe-plough.

In describing the benefit of the use of this implement he says, " The horse-hoe, or hoe-plough, has lately been successfully introduced into cane cultivation. It is applicable in all situations where the plough can work. The advantage resulting from its use is, not so much the saving of expense as the economising of human labour for other purposes, where animal or mechanical means cannot be made available; but its principal recommendation is the more effectual breaking and turning up of the soil, that being the real intention of the hoe. The objections to its use appear to be the great space that it occupies, and the danger to the young canes of being trodden down or eaten by the cattle while working it. These notions are at once remedied by simply planting the canes wide apart. But, says the planter, I cannot afford to lose so much of my field, and it is not right to expose it so much to the sun. It would be foreign to the scope of this work, to treat these objections philosophically; it may be sufficient to say, and we boldly assert it, that the cane is the worst weed to the cane; that a much larger return would be obtained from one field planted in rows at six feet apart, than from another, cæteris paribus, at three; and that the only season at which shade would be beneficial to the canes, if at all, would be when they are young, and when, consequently if planted ever so close, they would not afford mutual shelter, at a more advanced age, shade is apt to rot and retard their maturation.. The fact that thin planting is preferable to thin planting, nobody can doubt who has observed the different products of strong and weak plants. The greatest difference of having an equal crop from a small number of strong plants, and from a great number of weak ones is, that the soil is less exhausted by the former than by the latter, not only from the latters exhausting more in proportion to their number when young, and while each of them consumes as much nourishment as each of the small number; but also from the different increase that a strong plant makes by receiving the same proportion of food with a weak one. The plant which receives the least increase carries off the greatest quantity of nourishment in proportion to that increase. We remember to have seen this exemplified many years ago upon an estate in St. Elizabeth's, where one field, planted at six feet square, gave a larger return than the other fields which were planted at the ordinary distance of four feet square.

Our author adopts the theory of Tull with regard to the use of manure; that its beneficial action is to be attributed to its fermentation under the soil causing a more perfect pulverisation of the earth, and that therefore it should be applied as fresh as possible.—Tull went further and said, that pulverisation would supersede the application of dung altogether, and it is surprising how nearly correct such a bold assertion, and one so opposite to the general opinion, turns out to be. Although in northern climates, where a variety of crops are grown for profit, it is found advisable to take them in rotation, yet Liebig proves that in particular situations similar crops may be annually repeated without the application of any manure, the necessary alkalies and earthy matters being annually supplied by the disintegration of them from the soil caused by ploughing and the effect of the weather: and that in any case by the re-application of the small quantity of earthy matters carried away in the crop, and which constitute the ashes of the plant when burnt, and by ploughing the soil to destroy the excrements deposited by the plants when growing, the soil is put in the same favorable situation for the cultivation of the plant as at the commencement. Thus we see that Tull's theory was correct in some descriptions of soil, and was nearly correct in all cases, and therefore I will conclude with the words of our author, "Where once we ploughed before, we will now plough twice."

AGRICOLA.

THE PRIZE ESSAYS.

No. 4

TO THE EDITOR OF THE JAMAICA TIMES.

April 18, 1844.

Sir,—Having passed under review all the Essays, except the fourth, I must now, according to promise, at the commencement of the series, proceed to the consideration of this, the most important of all the Essays.

I could have wished some other party to have performed this duty, as I may be accused of partiality. It is now generally known, that the above named essay is the product of my own pen, but to prevent any cavilling, however, I think it better to state so explicitly. In acknowledging the authorship, I do so without a feeling of shame for its want of success, on the contrary, I think I have good cause to feel proud that it deserved the prize. That the great majority of the most intelligent readers have placed it at the head of the competitors, I have reason to believe; that public opinion will ultimately, without any opposition, award it the honor, I feel perfectly certain. It was probably too great an innovation on old plans to meet with success at first. Many of my friends warned me that it would be so, but I could not, for the sake of securing the money, run the risk of diminishing the credit that would ultimately attach to it. I am satisfied to await the result of public opinion, as the more it is tried, the more correct it will be found to be.

I have no hesitation in expressing my own opinion, that it is beyond comparison the best of the lot, and in the following review I shall endeavour to prove it such. In reviewing the other essays, I believe I have treated them with fairness and impartiality, and trust to do the same in the present case. If any parties, however, are inclined to dispute my right to the honor, I shall be most happy to hear all they have to say on the occasion, so long as it may be unaccompanied by vulgar abuse. In a matter so affecting the welfare of the island, as a change in conducting the cultivation of the great staple production of the island, the claims of individuals sink into insignificance, and the matter should be decided on the real merits of the case.

In reviewing the first Essay, I stated what I conceived to be the requisites for a successful competition: by these rules, I condemned the successful essay as being deficient in all the requisites; by these rules, I have judged the others; and by these, therefore, I propose to test the present one.

The requisites for a successful essay, I considered to be the following:—"The subject proposed being the economical cultivation of the sugar cane, the Essay might naturally be expected to treat of the different varieties of cane, showing those most valuable for cultivation: the soil best adapted for the cultivation of the cane, and the means to be employed to ameliorate the inferior kinds, and bring them as nearly as possible to the condition of the best. It might naturally be expected to treat of the preparation of the soil in the cheapest and easiest manner for the reception of the cane plants. It should then treat of the easiest and cheapest system of planting the tops, of applying the manure, and of cultivating the cane till it arrives at maturity. Every proposition different from the usual practice should be supported by argument, and proved to be economical by calculation. The errors of previous practices should be pointed out and proved to be fallacious. The instruments proposed for use should be simple and feasible: it is not necessary that they should have been tried, as the terms of competition did not require it, but they should bear on their face a strong probability of success. The plant canes having been brought to maturity, the Essay, without any party proposes a method of cutting them more economically than by the usual practice, reaches its limit for the present; the carriage of the canes to the mill, and the manufacture of the produce not being any part of the cultivation of the cane, and therefore not forming part of the terms of competition. The Essay might then be expected to resume the cultivation of the cane during the remainder of its growth in the state of rattoons. In addition to all this it would be expected that the different varieties of manure should be discussed, and their relative merits and cost stated. Such might reasonably be expected from all the competitors for such a handsome prize: good writing was not expected, but good sense; and that the plans should be clearly and methodically arranged and expressed, and the advantages and disadvantages clearly shown. These appear to me to be the great requisites, and by these rules shall I test the essays."

Having tested the other Essays by these rules, I proceed to apply them in the present instance, and to compare its degree of excellence with the others.' In the first point mentioned, namely the describing the different varieties of cane with their peculiar value,' this and all the other Essays are deficient: none of them enter into the discussion; in fact, so little interest have these matters hitherto excited amongst us, that I have not been able to meet with any one yet who could describe all the different varieties, or who knew the proper names of them: some call a cane by one name, and some by another, so that it is almost impossible to ascertain them correctly. As far as I have been able to find them out, the varieties of cane appear to be as follows:—

The Bourbon, or White Cane. As it is so well known, this need not be described.

The striped Bourbon. This is exactly like the Bourbon, with the exception of being striped with green stripes in a manner similar to the ribbon cane. This cane is one I have only become acquainted with during the last three or four years; I can find nobody to give me any satisfactory account of it; but I know several parties who are now endeavouring to propogate it. I conceive it to be the best cane in the country. It is, in conjunction with the Bourbon, cultivated by the small settlers for sale at the Kingston market. I planted in my garden two tops of each kind of cane it could procure, and amongst the rest two of it, and they grew more luxuriantly than any of the rest. A friend of mine, who was anxious to cultivate it, told me that he tasted a cane of that kind, and one of the common Bourbon grown in the same place, and that the striped Bourbon was much sweeter than the white Bourbon. If it is both the most luxuriant and the sweetest cane, it should be generally cultivated. I am inclined to think that it will prove to be so, though I do not consider the point decided; It is however, well worth a trial. I had intended to have ascertained the fact by squeezing some canes of each variety in a small hand mill I had made for the purpose, both to ascertain the comparative quantity of juice compared to the refuse trash; and the comparative sweetness of trashed and untrashed canes; but my leaving the district prevented my so doing.

The Otaheite Cane. This cane I do not know; it may probably be the last one named above: in common conversation it is usually confounded with the Bourbon.

The Montblanc, Blue, Violet, and sometimes also called white cane. all appear to be the same. It is the one usually in cultivation, and assumes all these colours under different circumstances of age and locality. It is well known, and needs no describing.—It stands in value next to the Bourbons.

The Ribbon or Striped Cane. This is similar in growth to the Montblanc, but it is striped purple, and white or yellow ; it makes a darker sugar than the other, and is harder to grind.

The Purple Cane. This grows like the Montblanc and ribbon canes in appearance, but the stem is entirely purple ; it is usually called the black cane, but it is a different species, having green leaves. The sugar is darker than that of the ribbon, and it is a very hard cane to grind. The cultivation of it offers no advantages over the Montblanc, not being hardier or requiring less cultivation.

The Black Cane. This, I believe, is the one introduced from the Brazils. Its stem is purple or black, and the leaves have also a purplish colour, very different from the leaves of the purple cane, which are green, It grows the same as the last three named, which in appearance can only be distinguished from each other by the colour of their stems, but this will be immediately known from all the rest by the colour of its leaves. The interior pith of this cane is pink coloured, and the juice is also pink; the pith of the purple cane is white, and the juice also white, unless hard pressure extracts the juice of the rind, which is pink. The dark colour of the juice makes the sugar very dark, and in no respect is it a cane worthy of cultivation.

The only other cane that I have seen is the old country cane, which I cannot better describe than by saying, that it is a Bourbon in miniature.

I am happy, however, to be able to say, that we are to have our stock of canes increased by the two most valuable varieties from the Sandwich Islands. The one is a luxuriant cane and very saccharine and is the most highly prized by the natives ; this I propose to call, in honor of the gentleman introducing it, the Charlton cane. The other is a much larger cane, but not so highly prized by the natives ; in fact it is described as gigantic; and this I propose to call the Wharton cane, after the gentleman through whose exertions we are chiefly indebted for the promise of the plants.—Abundance of cane seed will also be sent, but these two valuable varieties are to be sent in a growing state by two different conveyances, and are destined for the Bath gardens.

All the authors having omitted the description of the different varieties of cane, I have endeavoured to the best of my ability, to supply the deficiency.

As to the kind of cane to be cultivated, the author decides in favor of the Bourbon. ‘ I should give a decided preference to the Bourbon. It is commonly considered not to rattoon so well, but as far as my experience goes, I find no difference in the length of time it rattoons. It will not stand ill usage or neglect, like the violet, but, if properly cultivated, I see nothing to prevent it from ratooning as well as any other cane ; it requires more cultivation, but this is counterbalanced by the greater quantity and finer color of the produce.’

The next point is ‘ the description of soil best adapted for the cane ; and the means to be employed to ameliorate the inferior ones, and bring them as nearly as possible to the condition of the best.’ On this point the present Essay treats more fully than any of the others. ‘It seems to be universally admitted that a brick-mould is the soil most favorable for the cultivation of the cane. Whether it is really the best, I cannot pretend to decide, but I can positively say, that it is an excellent soil for producing both a large quantity, and a good quality of sugar; it is one also easily cultivated by agricultural implements, and for this reason, economical. It is, therefore, an object to assimilate other soils to it as nearly as possible ; and it will be worth while to go to some expense to do so, if the determination is come to of keeping the canefields constantly in cultivation. Now, what is the constitution of the soil, commonly called brick-mould ? Without using technical language, it may be described as an intimate mixture of clay and sand, in such proportions as to be easily permeable to the atmosphere and rain, neither retaining moisture too long, nor allowing it to evaporate too quickly. The only soils commonly kept in cane cultivation, besides the different kinds of orick-mould, and which are capable of being ploughed, are gravelly soils and stiff clays. Gravelly soils can only be assimilated to brick-mould, by the application of large quantities of clay spread upon the soil, and well incorporated by the plough, and this is a very expensive operation. Stiff clays are more easily brought to imitate brick-mould, and with much less labour, by spreading sea-side sand on the surface of the soil, and ploughing it in. As the plough breaks the surface, the sand runs down the cracks between the clods, and prevents them from binding again ; a small quantity applied this way will have a great effect. The subsoil plough following, a great part of the sand will run into the lower strata, and effectually prevent it from binding. I should say that a hundred cart loads of a cubic yard each, would be sufficient for each application ; that would be a cubic foot of sand for each twenty (not seventy, as printed) feet of surface, and supposing that the ploughing mixes it with the soil a foot deep, it will be one foot of sand for every twenty (quere 16) feet of clay. This quantity will have a considerable effect, but may be repeated again to advantage in future years.

"Many estates along the seaside are of a very stiff clay, and have abundance of fine sand, within a short carriage, for the trouble of getting it. The application of sand is generally considered in the light of manuring; it will undoubtedly furnish fresh inorganic materials for the plants, but its chief use is in its mechanical action, by preventing the soil, when pulverised, from binding again, and keeping it permeable to the beneficial action of the atmosphere and rain. When sand is not to be had, fine gravel may be used, or marl, which contains both the organic and the inorganic constituents of plants."

From the views developed by the author in the course of his Essay, the conclusion must be come to that every soil that has once borne good canes may be made to do so again; it is therefore unnecessary to inquire any further than for the purpose of ameliorating the mechanical texture of the soil, which is the best cane soil. If the land have once grown good canes, it can be made to do so again, by returning to the soil, and mixing intimately with it, whatever has been carried away during the subsequent course of cultivation. The long tops carried away may be supposed to have been, after consumption, returned regularly in the shape of dung; and the canes carried away may be supposed to have been returned, or at least an equivalent value for them in the shape of the guinea grass used for foddering the stock; if such is the case, and these matters are intimately mixed with the soil by ploughing, the land is in as favorable a situation for bearing canes as at first. If these matters have not been returned in as large quantities as they have been carried away, the easiest and best way of supplying them is by the application of wood charcoal and wood ashes mixed together.—These substances may be had, in any quantities, for the cost of burning them, the supply of wood land being inexhaustible they will answer the purpose equally well with imported manures, and at far less cost. They are also the proper manures for renovating guinea grass pastures, which have in many places been nearly destroyed by the constant carrying away the grass for manuring the cane land, to supply the deficiency caused by the constant drain of canes going on. Woodlands are of no value, while guinea grass is of great value; the woods, therefore, and not the grass pieces should be robbed to enrich the cane land. In burning charcoal, the large wood should be burned for that purpose, and the small branches and leaves should be converted into ashes, as they contain a much larger portion of inorganic matters than the wood.

The next point to be considered, following the order of review, is that the successful Essay should treat of the 'preparation of the soil in the cheapest and easiest manner for the reception of the cane plants.' Let us see how the present Essay will stand the test of criticism in this respect. On this point, the present Essay treats far more copiously than any of the others, as being a matter of the greatest importance. The preparation of the soil is commenced by fallow ploughing. The author proposes not to apply any manure in the common way, for reasons which will be hereafter described, but to plough in the grass, or trash lying on the land in lieu of carting manure to it. Without the soil 'be unusually barren,' (which barrenness is to be judged of by the luxuriance or the poverty of the weeds growing there,) 'there will be no occasion for the application of manure.' This statement taken singly, may appear strange, but the author subsequently proposes a plan of enriching the land to any extent during the subsequent course of cultivation, and which will quite do away with the necessity of manuring in the common way. But to proceed with the preparation of the soil. 'From what we have already read, it will be remembered that there is a large proportion of roots and excrementitious matter, besides the vegetable matter on the surface of the soil, left by the previous crop, whatever it had been, ready to be converted into humus, and to afford nourishment to the plant whilst young, which change is accomplished by the plough exposing it to the oxygen of the atmosphere. This humus will be sufficient nutriment for the young plant, till it grow large enough to extract its nourishment from the atmosphere.

'The grass having been eaten down by the stock, the plough must fallow the land in the manner of close ploughing. If the grass be long, or the trash troublesome, fire may be run through it to facilitate the ploughing, but, if not very troublesome, it is better to have them turned in with the plough, as all vegetable matter, whether green or dry, becomes converted very speedily into humus, upon being incorporated with the soil. And, if we apply no manure, it is of consequence that we should not diminish the quantity we have naturally.'

With regard to the best kind of plough, No. 4 says, 'the best plough for the purpose, is Wilkie's wrought iron plough, made for four horses, and worked by six or eight cattle. Most people work eight or ten, but I have found that six, when properly broken to the draught, are competent for turning up the soil in the driest weather. It is better to have the plough of the strongest description, for fear of loss of time and inconvenience by the breakage of a slighter implement.'' It appears also to be the opinion of the other Essayists, that the ploughs ought to be large and strong, but I confess I have lately had my doubts very strongly aroused on this point. I am now induced to believe that one horse ploughs, worked by fewer cattle, would be preferable. I believe that two cattle, and one man and boy, could plough the stiffest land when accustomed to the work. A gentleman from the United States now in his country, and who, like all other settlers in new countries, is accustomed to put his hand to the plough, tells me that in his district no one ever thinks of working more than two horses or two cattle, and that they will work the same stock from Monday morning till Saturday night, even in stiff soils, and during long spells of dry weather. The ploughs used are small wooden ones, and very light. His account of the management of rural affairs would raise a blush on the cheek of the West India Planter. A farmer goes out to plough in the morning, and if he should happen to break the beam of his plough, he takes his constant companion, a bright and well sharpened axe, goes to the woods, cuts a stick, fits it into his plough, and ploughs again the same afternoon. In fact, they make their own implements, and do almost every thing without help. They will plough land almost as steep as the roof of a house, though only just cleared out of timber: the stock are so well broken to the draught that they turn in and out among the stumps, and seldom break the plough. The cultivation of the land is so cheaply performed that they can sell corn for six-pence a bushel, and make profit out of it, whilst we are satisfied to pay six-pence a quart for it when we want to indulge our horses with a feed. Of a truth, we want a little American energy infused among us to help us out of our difficulties.

This account of the American ploughing has brought the subject more forcibly to my consideration. The statement might be put down as a Yankee exaggeration; it is, however, no such thing; it is the statement of a British emigrant, and every way worthy of belief; and it shows most forcibly what a misapplication of labour we still suffer under, and how much we might do if we fairly put our shoulders to the wheel. I said above that I was satisfied that such a system would succeed here.—I have myself proved the truth of it. 'In the present Essay will be found an account of the operation of the hoe-plough, which is most strongly recommended for the cultivation of the cane while growing. The hoe-plough is a miniature plough of the Wilkie construction, and made by that person; it is intended to be worked by one horse. It is likely to be more generally useful for agricultural purposes than any other implement, except the large plough. The cost of it is about four pounds, besides the freight and charges. I have worked it with one horse in hard soil, I mean land not previously ploughed, although the horse was not corn-fed at the time, and was not accustomed to draught. It is made to go about five or six inches deep. The horse being my private property, I usually worked the hoe plough with two cattle yoked abreast. All the land operated on was the hard soil between rattoons, not having any young plants at the time. Two cattle were worked in the morning, and two in the afternoon, and each spell ploughed a quarter of an acre of hard soil in the manner of close ploughing.' From what I have lately heard, in conjunction with my own experience, I should recommend parties to give smaller ploughs a fair trial.

As the draught of a plough, or the power necessary to work it, depends much upon the setting of it, and as it is a matter little understood in this country, I will give for the benefit of the public, the instructions I received on the point from perhaps the best practical ploughman in the country, I mean Mr. Forrester, of St. Mary. The sock of the plough should be put on so that the point should bend downwards a little below the level of the sole of the plough. If the plough is placed on a plain surface like a table, it should rest on the front point of the sock, and the hinder part of the sole: the friction caused on drawing it along, will then be confined to these two points, instead of having the friction of the whole extent of the sole to contend with. A small inclination downwards of the sock will be sufficient; the rule is that you should be able to insert a wheat straw, or that there should be a clear space of the eighth of an inch under the plough, at the junction of the neck of the sock with the sole of the plough. The friction sideways is reduced in the same way, by placing the coulter half an inch to the land side of the stock; the part of the land cut away by the coulter is thus half an inch more than that cut by the sock, so that instead of the whole upright side of the plough rubbing against, and causing friction with the unploughed land, only the side of the sole plate, being the part below the level of the point of the coulter, rubs against the hard soil. By these two operations, the friction is very much reduced.

The Essay, in the preparatioa of the land, recommends the laying it out in beds, as at Plantain Garden River district, with wain tracks acting as trenches between them; and also subsoiling the land; and as both these operations appear very simple and advantageous, and are not usually practised, I will quote the paragraphs. Having proposed in his system to keep in only a small cane-field, and that permanently and in the highest state of cultivation, the adoption of these practices would prove highly advisable.

"In preparing the land for remaining permanently in cane some extra labour may be advantageously bestowed in forming the land into ridges of such a size and shape as will be most beneficial for draining the land. and taking off the produce with facility. By means of the plough the land can be rounded up so gradually that very few trenches will be required to carry off the surface water.— In the old way of digging, the beds were made narrow that the people might be able to haul the dirt with their hoes to raise up the centre cf the bed; it was generally, however, so badly done, that the beds are usually found to be low in the middle and high next each trench. Fewer trenches being necessary, from the gradual slope given to the land by the plough, I propose to throw two beds into one, each bed will then be double the width, and each trench also double the width.

" My object in making the trench wide is to allow carts to travel up and down in dry weather, for carting away the canes, instead of passing over the bed and destroying the stools. Two ploughings in the same direction will usually accomplish this, but sometimes a third may be necessary, so as to raise the top of the bed where the trench was before. The cane-pieces, in Plantain Garden River district, are many of them laid out in this way, and to great advantage.

" I have an additional object in laying them out on this plan, as I plough my cane holes long ways of the bed, instead of crossways as commonly done. There is a great advantage in the plan now-a-days, from the facility it affords for tasking people at their work; each bed will be cleaned by itself, the size will be exactly known, and the work easily inspected; when ripe, each bed will be cut by itself, and will therefore not take more than one or two days; immediately it is cut, the wain carries away all the canes up the trench or wain-track without going on the canestools, the people burn off the trash, and the plough commences its operations before the remainder of the piece is finished cutting. So many advantages being to be obtained, I don't think that any body will object to the cost of the extra ploughing."

Leaving the modus operandi for the above work, let us proceed to subsoil ploughing. " Here, let me recommend the use of the subsoil plough; it has been used most beneficially at home; in many places, particularly in stiff soils, doubling the produce. The beneficial effect of it is easily explained; the capability of the soil is in proportion to the depth of the staple; a soil with a staple fifteen or eighteen inches deep, must be much more productive than one only eight or ten inches deep, particularly in a hot climate subject to long spells of dry weather; the roots of plants must have twice the room to extend and take in the carbonic acid and ammonia deposited there by the atmosphere and rain; the soil must retain moisture also longer in dry weather, and in wet weather, the subsoil being porous, the superfluous water will drain quicker away.

"I have never practised subsoil ploughing, but should certainly do so if working on my own account, so convinced am I that the expense would be returned with compound interest. The operation is very simple and not expensive: a second plough follows the heels of the first, but without a mould-board, only the coulter and sock being on; it is worked the usual depth of eight or nine inches, (I now think that this is deeper than could be managed with facility, but I think six inches would be accomplished,) and loosens the soil to that depth below the bottom of the furrow formed by the first plough; but there being no mould board, the subsoil is not turned up to the surface, the rich soil or staple still continuing on the top. The operation simply loosens the soil to a greater depth, and by allowing the atmosphere and rain freely to penetrate it, it is, in time, converted into a soil similar to the staple. It becomes impregnated with the carbonic acid and ammonia of the atmosphere, and the excrements of the plants deposited in it, and the dead roots in it, are converted into humus; at the same time one of the most beneficial results from it must be the causing a large portion of the alkalies necessary for ensuing crops to be disintegrated from the soil. It therefore, in every point of view, appears to be a most beneficial operation."

I perceive that a proposition has lately been made for sub-draining estates. The sub-draining will be of no use without subsoil ploughing to enable the water to find its way into the drains. It is questionable whether subsoil draining will be beneficial to the cane, as, in dry situations at least, it might leave too little moisture for the advantageous growth of the cane. English agriculture suffers from a redundancy of moisture, but does Jamaica agriculture suffer from the same cause? I think it questionable. Subsoil ploughing appears to offer all the advantages without the probable disadvantages of sub-draining.

In the preparation of the land, No. 4 enters very fully into the discussion of the proper width of cane holes, a point of great importance in cane cultivation, and one but slightly treated of in the other Essays. The facts brought forward in confirmation of his recommendation of planting canes wider apart than usual, appear incontrovertible, but for these the reader must refer to the Essay itself. Many parties are now in this country, trying the wide planting, and all the cases I have heard of appear successful as far as they have gone. "The land is now ready for making the cane-holes. The object of all parties seems to be to make the ploughed holes exactly like the dug ones, with a wide space at the bottom, and a high bank at the side, like a ditch. This is generally accomplished by going once up and once down with the single plough, and then cleaning the hole out, or enlarging it, with a double-mould-board plough. The practice is quite absurd. Nothing more is required than a simple furrow with the single plough. There is no bank required. If the soil is pulverised, the cane roots will run into it in all directions. In the old fashioned dug cane-hole the only pulverised soil was what was on the bank, all the rest of the soil was hard and impenetrable, or nearly so, to the roots, it was therefore a great object to get a large bank of pulverised soil; but where the whole soil is pulverised, what can be the use of the bank? In making the cane-hole therefore on my plan, not more than one-third of the cost of the usually ploughed cane-hole will be incurred.—Three acres a-day ought to be done, equal to a cost of two shillings an acre. I shall prove, further on, from the manner in which the cane grows, that it does not require moulding, and therefore no bank. There is another objection to the high bank; you cannot, on account of it, plough between the young canes, otherwise the bank would be thrown down, and the young plant buried.

"The distance between the rows should not be less than six feet on any land. A less distance will not allow for proper tillage between the canes, neither will it allow them space enough to come to maturity. Our object is to plant the cane at such a distance, and get such a growth as will cause it to thrive luxuriantly for years, and to give as large a return, or nearly so, as at first.—We ought to follow the plan of treating the cane as an orchard cultivation, and plant the canes at such a competent distance, like a young fruit tree, as will permit inter-tillage, and insure crops for years. From my own experience, I should never form cane-holes nearer than six feet in ploughed land."

From the above, it will appear that the author has fulfilled the requisition that the successful Essay should treat fully on the preparation of the land for planting. Let us see how the next requisite is complied with. It is as the "cheapest and easiest system of planting the tops." In this respect the present Essay far exceeds all the rest. The sixth and seventh Essays are the only others that reckon the cost of the operation, and they put it down at twelve shillings; while the present Essay only reckons six. And this, considering how much thinner than usual, he recommends the tops to be planted, is by no means a low estimate. He states that in one case he got them planted at a dollar per acre: the man dropped the tops singly about every two or three feet along the row, and covered them with a little earth thrown on by his foot, and made nearly a dollar a day wages at the job, so quickly can the operation be performed in well ploughed land, and with thin planting.

" In the chapter on the preparation of the soil, we have decided on the adoption of six feet rows of the cane; we have now to decide on the distance which the canes should be planted along the row. My opinion is, a single top every two feet for Bourbon, and every two or three feet for Montblanc or Violet Cane; the Bourbon cane not stooling so freely as the other. They should certainly not be *nearer* than that; I shall plant even further apart." (In printing the Essay the word *more* is substituted for *nearer*, thus reversing the meaning of the author. In several other places the most gross mistakes have been made by the printer, quite altering or obscuring the sense of the passages.) " I object to 2 tops being planted together, as every top planted will grow, and the stool from the united growth of the two tops will not be larger than the stool from one top; the one top will have as much nourishment as the two, and the stool has an inexhaustible supply of eyes ready to throw up as many canes as the land can maintain. But if the united stool from the two tops be not larger than the stool from the one top, each part of it will only have half the vigour necessary for sending roots deep into the soil to extract moisture in dry weather, and for searching for food in the soil. It will, therefore, in the end, not prove so luxuriant as the single top planted." The arguments in favor of the practice are too long to quote here, but I think, from the perusal of them, every unprejudiced reader will arise with the conviction that the reasoning is correct.

The Revd. Mr. Cork, in his letter on cane planting, two weeks ago, in advocating thin planting, suggests that single eyes should be planted, and not tops with four or five eyes. The planting single tops with about four eyes turns out perfectly successful, producing the most luxuriant stools of cane; the only case where I knew of a single eye being planted was one I tried myself, and it did not succeed at all well; it vegetated, and after some time threw up about four or five small canes, but did not arrive at more than one-fifteenth or twentieth part of the luxuriance of the tops planted with four eyes each. There may have been some cause operating against it in this instance, but I do not know of any. In some of the tops planted with four eyes, the first eye failed; and I attribute it to this cause. The rootlets that furnished each sprout with sap, are those that come out round the joint below; at least so they are represented in Porter's work on the sugar cane: in planting single eyes then, you cut away all the rootlets that ought to supply the eye with nourishment, and therefore the vegetation cannot prove vigorous. I do not mean to say that such is the case, but suggest it as the probable solution.

The planting is a very simple operation. The land having been well fallowed, and a small drill made with a single plough, "The man is to take as many tops as he can conveniently carry, ready trimmed and dropping one every two, or three, or four feet, as may be determined upon, and according to the kind of cane, press it slightly into the soft earth by putting his foot upon it. It is unnecessary to cover the top, in fact it is preferable for him not to do so, as tops are much oftener destroyed by being too deeply buried than too lightly. Scarcely a sprout will find its way up if buried two inches deep, which I ascertained accidentally in my garden. There is another reason for not covering the tops. It is a most difficult thing to get the labourers to plant them thin, and although you bargain with them specially to do so, and pay them high for the purpose, the force of old habit prevails, and when your back is turned they plant double allowance. The cane will take root immediately it is planted, although it is not covered. I therefore recommend them not to be covered at the time of planting: 'Dead men tell no tales;' and if the tops are buried, you have no security as to the distances at which they are planted, and when they grow, you have the mortification of finding that your orders have been set at nought. After a few days, when the cane begins to grow, a person may be employed to cover them lightly, but without the weather is dry it is unnecessary.

"One man, in this manner, will plant fully half an acre a day. (The printer has made it *fully an acre*) he will also cover the tops at the rate of an acre a day, so that the planting costs six shillings an acre.

"The following should take place, as Cobbett says, immediately after the forming of the furrow. These are his words—'This work (transplanting) should be done in *dry* weather if possible. and *should follow closely upon the heels of the plough*. This is a thing prodigiously advantageous to the plants; for a fermentation takes place in the earth at every moving, and here this fermentation comes to the aid of the plant, which has a root ready to be operated upon, and which strikes off immediately.' Although he speaks only of transplanting, the same reasoning applies to planting."

For the arguments in favor of thin planting along the row, as well as for having the rows wide apart, we must refer the reader to the Essay itself.

Having planted the cane, I may here, like the author, digress for a little to say a few words on the corn question. The settlement of our corn laws appears likely to excite as great a commotion in our literary world as the great corn laws in the political.—The battle is as to whether corn being planted with the cane is beneficial or injurious. The one party say that it is planted for the purpose of shading the young cane; that it acts the considerate part of a parasol; that not only so, but that if the cane should stand a chance of being drowned, the foster-mother will kindly drain up all superfluous moisture; and still further, that so good a nurse is it, that if the cane thirsts for moisture, it will attract dew for its refreshment. Really the other party must be obstinately blind to so many and great advantages; they doggedly insist upon it that shade is quite unnecessary for the cane; that corn is planted for profit only; and that corn crops are exhausting and injurious.

Corn used to be planted for the purpose of raising small-stock, as the cheapest way of feeding the white people employed on the estate; the practice was permitted, and if a surplus existed it became a perquisite to the Overseer, and if the Attorney was asked a reason for such a thing, he would say that it was an inducement to the planters to manure the canes highly for the purpose of getting a good crop of corn. Such a thing as shading the canes was never heard of. In many parts of the Island the raffle ants destroy the corn crops, and the Overseers have given up the cultivation of it, not because it won't shade the canes, for it generally grows eighteen inches high before the ants destroy it, but because, and solely because, they get no seed, and, consequently no profit from it. If they had planted it to shade the cane they would have continued the cultivation of it, or looked for a substitute, but such a thought never enters their heads. The idea of canes requiring shade is very much like black ladies requiring parasols to save their complexions.

A proprietor resident in this country once tried it for his own satisfaction, and obtained nearly half a hogshead an acre more from the part having no corn than from the part having it. It is likely, however, that, as the author suggests, it may have proved beneficial in improving the quality of the sugar when land has been heavily manured by fly-penning, and that if repeated only at long intervals, it may not prove perceptibly injurious to the land.

In Saint Mary's, in Metcalfe, and in Saint Thomas in the East, I should think that one half, at least, of the canes planted are now put in without corn, and no injury has yet been found to result from the want of it. For the last four or five years all the canes I myself have put in, have been without its protecting influence.

As to its drying the land in wet weather, and wetting it in dry weather, I leave that to be decided by the scientific parties at present engaged in the dispute. It has always appeared to me however that the corn is the first to suffer from the dry weather.

The next point to be considered, passing by the discussion on 'manure,' for the present, is the 'cultivation of the cane till it arrives at maturity.' On this point the Seventh Essay equals in cheapness the present one, but the matter is much more fully discussed in the present Essay, and the directions are more explicit.

'About three weeks or a month after planting, the young canes will want weeding. The drill itself must be cleaned by manual labour, and as the drill will not be more than one foot wide, there will be five feet left to be cleaned by agricultural implements. As the land was freed from weeds by the preparatory ploughing and harrowing, the labour will be very light. The drill having been weeded by manual labour, the horse hoe must be brought into operation. Whichever hoe is used, it is a matter of little consequence; they are all made for working with one horse, or two cattle; those with flat hoes will do the work more superficially, and those with harrow teeth, or coulters, will go deeper. If there is no horse-hoe, the little plough will do equally well, in fact better, as the work is deeper, although of course, the operation proceeds more slowly, as only one furrow can be taken at a time.

'If a horse-hoe is used, the two cattle may work abreast, as they will not tread, if carefully guided, on the young sprouts. It will be necessary for them to go once up and once down each row, not being able to take the full width at once, and for the purpose of destroying, more effectually, at the second, any weeds that escaped at the first turn, besides pulverising the soil more. They should do two acres a-day, and the same three people being employed, the operation will cost about two shillings an acre: I will reckon three shillings. I have reckoned the horse-hoeings at three shillings an acre. Tull reckoned his at only sixpence. He continued hoeing till he extirpated all the weeds, as he never allowed them to flower. I have reckoned three people to be employed with the horse-hoe; after practice, I expect two will be found sufficient, a boy guiding them with a nose-ring, and the ploughman, but we cannot expect to do so at first. In all my calculations I shall consider that the work is given out by job-work, and at such a rate that an ordinary working man may be enabled to earn at the rate of half a dollar for a day's work. Another matter must also be mentioned. I always endeavour to commence cleaning the canes before they are usually considered to require cleaning; I thus keep ahead of the work, and am enabled to get it done at what are considered very cheap rates. It is by far the cheapest method in the long run, and it must be allowed that it is more beneficial to the plant to have two cleanings at a dollar, than one at two dollars.

'At two months old the young canes in the drill must have another handweeding, and at the same time, the horse-hoe must be again put to work.

'At three months old, the hoe-plough (not the horse hoe) must be employed. The land is now becoming too solid, and must be deeply loosened. The ploughing commences next to the cane, and the earth is thrown against it, or, as commonly said, it is moulded. The same operation moulds the corn. The cane at three months old is able to bear the mould being thrown against it without injury. This is the only moulding the cane receives. It is simply filling up the drill to make the land level. The hoe-plough continues to work up and down the row till the whole receives a good ploughing to the full depth of the plough. This operation, of course, destroys all the weeds.

'At four months, and again at five months, the cane piece may receive another horse-hoeing, which will be all the cultivation that the cane will require. It will, by this time, have a most luxuriant growth, and will expel all fears as to the non-ability of covering the ground, although so thinly planted originally.

'As no further labour is bestowed on the canes, of course they are not trashed. The width of the rows; the thin manner in which the cane is planted; the not using animal manure to force on an over-luxuriant growth, and which trashing is only the means of remedying, do away with the necessity of the operation altogether.—This is another practice proposed, so totally at variance with the usual practice, that it is necessary to investigate the subject fully.'' In doing so, the author shows that in the wet climate of Demerara the practice is given up; that he had given it up with good results in his own practice; that the experience of many old planters among his friends leads to the same conclusion; and that in the East Indies the trash, instead of being pulled off, is carefully tied on the canes.

I have many times proved it from the experience of others, by asking what results they had experienced in particular cases, without explaining the object I had in view; when they have nearly always proved, that canes that they had manured unusually highly and expected would yield very largely, and give good sugar from being constantly trashed, had disappointed them sadly, if not in the quantity, at least in the quality of the produce: and almost every one could tell of some cane-piece, the cultivation of which had been neglected, and from which he had expected scarcely any return, yet to his surprise yielding most abundantly. I remember one case in particular that occurred to a planter in St. Mary's many years ago, and which he mentioned when I argued the point with him. He had occasion to go to Kingston for a day or two, and told the headman, upon leaving, to cut a certain piece of, as he thought, ruinate canes, never having trashed them at all; and which he expected to be finished cutting by the time he came back. He came back at the appointed time, and found the piece not half cut; he immediately began to grow vexed, as overseers used sometimes then to do, sent for the headman, and asked rather angrily what was the reason that he had not obeyed his orders; whether the mill had been broken; or what had stopped the work, 'Massa,' the old man said 'the mill no broke; the work no stop; cane too much in the piece; we can't get on with it none at all, the cane thick too much; and the juice sweet to pieces, it no waste none at all in the coppers." The overseer listened with some incredulity, but when he went to the field and the boiling house, and found that the old man was right: and ever after that he altered his opinion most materially as to the benefits to be derived from trashing the cane. But those were the days when planters had no right to think for themselves, else he might have altered his practice.

Since writing the Essay, the author has become possessed of further information respecting the modes of agriculture adopted both in Barbados, and in St. Christopher's, and as both systems coincide with his own recommendations in the chief points of management, and as, in reviewing the Essay, we have gone through the cultivation of the cane up to the time of cutting they may very properly be introduced here. The first I shall give are Mr. C's. notes on Barbados. This gentleman is the possessor of several properties in this island, and taking a deep interest in their profitable cultivation, paid a visit to Barbados for the purpose of gaining information. That information he has kindly permitted me to publish.

" The Bourbon cane *only* is planted in Barbados. Plants yield two to three hogsheads sugar when well planted; first rattoons, one to one and a half hogshead; second rattoons, one hogshead; and third, about three quarters of a hogshead per acre. This year the plan of manuring the second rattoons has been adopted by giving a hogshead of rape dust or soot to the acre of canes, and which will no doubt increase the produce. The canes are planted in the months of December, January, February, and March, in holes of four feet square, and *one* plant to each cane hole is the *usual* practice, but trials are now being made of one plant to eight feet by four. During the proprietor's absence in England, his manager planted more than one plant to a cane-hole, and as they seemed not to thrive so well, they were all taken out but one plant, which then came on much better. It is not usual to pull *any* of the trash off the canes. When the soil is deep, the cane plant is put into the soil so, *I*, a vertical hole being first made with a crow bar ; the cane top is about seven or eight inches long, and only the flat of the cut end is left visible, and it is placed sloping from the wind. The bank from the above holes is *never* given to the plants, nor rattoons afterwards. Two friends of mine have each planted a piece of canes for the ensuing crop, the dung having been laid on and ploughed in, and the canes planted with the crow bar, but without *any cane-hole* or furrow ; one of them has cleaned the same with the scarifier, and he expects over three hogsheads an acre of forty inch truss. Another friend at one time treated some canes in the same way, only in addition made one chop or dig of the hoe to each plant, and that piece gave him 150 pounds more sugar per acre than any other of his plant canes. The plant ought to be put firm in the ground, and will stand six weeks of dry weather. An opinion has been gaining ground here that canes planted a greater distance than four feet would be advantageous, and I have seen some planted four feet by eight wide ; and the canes grew very large from having so much room. One of my friends tells me that he has one and a half acres of canes planted on the flat, that is without *any cane-hole*, but 'crow-barred ;' that are the best canes he has ; they were planted in Dec., and are now all *lodged*, and he says they will make at least five hogsheads from the one and a half acres."

These notes were taken after the writing, but before the publication of the Essays, and therefore afford a very gratifying proof, to me at least, of the correctness of my proposals. Here we see the author's recommendations actually in practice. The Bourbon Cane alone cultivated. Thin planting adopted. The inutility of cane holes exemplified. No moulding, and no trashing of canes, as the *usual* practice.

The Saint Christopher system is much the same. The extracts I shall give are from a work published in 1800 by Clement Caines, and are letters addressed to his son, with instructions for the management of an estate, and are very interesting.

' Some planters prefer in their cultivation, small holes and narrow banks; others, large holes and wide banks. I must confess, that I am a favorer of the latter mode of cultivation; because it certainly possesses some advantages which the former cannot pretend to; and because it is a moot point from which of the two methods the return is most considerable. An undoubted advantage from large holes and wide banks, is the saving of plants, and consequently the still more important saving of labour. Labour too is saved in every weeding, which is performed not only with greater facility, but more completely, in large holes and wide banks, than in small. Seven feet for the hole and bank appears to me the best measure that can be adopted in the lining of land. It is my opinion too, that this measure had better, at all times, be rather increased than diminished.

' The most important circumstance in the planting of the sugar cane, is the time selected for this purpose. I now speak of the Otaheite; for none but the devotees of folly, obstinacy, and the blindest prejudice, can persevere in the cultivation of the old cane.

' Remember too, in all seasons, that burying plants deep will infallibly suffocate them, in nine instances out of ten: for the banks have always a tendency to slide down into the hole, and cover still deeper whatever is deposited there. The land should be planted, if possible, immediately after it is holed.

' A good planter will never, on any account, suffer his canes to be foul. Weed them at least some days, often a week, or even a fortnight, before an indolent neighbour will tell you that there is any occasion for it. When you weed plants, never give more of the bank than falls into the hole of itself. Drawing in the bank is a superfluous, and useless task. In dry weather this unnecessary practice never fails to be injurious. It checks the growths of the cane, and occasionally suffocates the vegetation it was intended to accelerate.

' Another folly, brother to the foregoing, an elder brother it should seem, from its superior size, is stripping the voura (dry leaves) from the cane. This absurd custom is attended with all the ill consequences of drawing in the bank, and with all in a greater degree. The labour is much more considerable; the growth of the canes is invariably checked by it; and in low land situations, if the ridiculous practice is succeeded by dry weather, the canes never recover from the injury it entails on them. All mistaken customs may be traced into some vice. Vanity is the parent of this. Some silly cultivator, to exhibit the growth of his plants, to show that they had a joint or two more of cane, than his neighbours, stripped off the voura ; and not to be disappointed of his purpose, a blade or two above the voura. Envy imitated the example that was set by ostentation ; and that her canes might seem as long, and look as trim as his, robbed them of the useful covering, which nature, wisely rather than beautifully, had furnished for their protection."

Here, again, we see another strong confirmation of the author's practices. Wide holes, Bourbon canes, shallow planting, not moulding, not trashing, all recommended.

So far as we have gone, the present Essay has complied, to as great, or to a greater degree than the others, with all the requisites for the successful one. In reviewing the first Essay, in naming these requisites for a successful competition, I stated that 'every proposition different from the usual practice should be supported by argument, and be proved to be economical by calculation : and that the errors of previous practices should be pointed out, and proved to be fallacious.' Throughout the Essay now under review this has been constantly kept in view ; every thing now has its reason assigned for its recommendation ; the old practices are shown to be fallacious ; and the expence of each operation has been carefully calculated , and this is done, in each respect, to a far greater extent than in any of the other Essays.

'The instruments proposed for use should be simple and feasible.' It is impossible then any set of implements could be more simple than those proposed in the present Essay : a large plough, a small one, a common harrow, and a horse hoe, constitute all the implements requisite : they are all well known, and there is no difficulty or risk in the application of them. In this respeet, therefore, also, there is no fault to be found with the Essay. The sixth and seventh, and eighth Essays, are in this respect also equally good.

'The Essay (having brought the cultivation of the plant canes to maturity), might then be expected to resume the cultivation of the cane during the remainder of its growth in the shape of rattoons." In rattoon cultivation the second, fifth, and sixth Essays all contain much useful information, but none of them any plan preferable to the following one. The Rev. Mr. Cork has very pithily described it in his letter on planting. 'My advice is, *burn*, and then *hoe harrow or plough.*' However, let the Essay speak for itself.

'It will be remembered that I advised the laying out of the land into beds, and in making of the rows in the same direction as the trenches run, as for one reason among others, i. would facilitate the cultivation of the rattoons.

Supposing such advice to have been followed, each bed must have the trash burnt off it as soon as the canes have been carried away, a person being employed previously to haul the trash out of the wain tracks, (or trenches) to prevent the fire from spreading. The burning off is an easy business, and cannot be calculated to cost more than a shilling an acre.

'I wish the trash to be burned off as quickly as possible, before the long tops wither too much, as my object is to convert a part of the green matter into charcoal, and not to turn it all into ashes. By burning the trash also, before it becomes perfectly dry, a great object will be gained by preventing the moist rotten trash next to the ground from being consumed; this matter is just in the state for affording nutriment to the plant, and should be ploughed in to enrich the soil. For, it must be remembered, that I recommended ploughing the land and planting the canes without waiting for the delay, and expense of manuring, as we would adopt such a course of cultivation as would enrich, instead of impoverish the land. It is a great object, therefore, that all the rotten trash should be ploughed in. Liebig proves that the plants return as much humus to the soil, in the shape of excrements, as they extract as food from the soil; the quantity of decaying vegetable matter to be ploughed in, is, therefore, an addition to the richness of the soil; and, therefore, I say, that by this system we must make the soil richer instead of poorer.'

The soil will me made richer in *humus*, but not in the inorganic parts, for some of these which have been extracted from the soil are carried away in the sugar cane. For the restoration of these particles, the author trusts to the well-known power of the plough in separating the alkalies and minute earthy matters during a summer fallow, and which summer fallow his proposed mode of cultivating, to all intents and purposes, is. But let us see if Liebig does prove that by ploughing in a part of the vegetable matter yearly the land would be be enriched, as it is most important to be certain of this; and also whether we may expect that a summer fallow would act as supposed. We know very well that both substances may be replaced, as indicated before, if necessary, by the application of charcoal and ashes; but it is an interesting investigation to see if such can be avoided.

'Let us now inquire, says Liebig, whence the grass in a meadow, or the wood in a forest, receives its carbon; since then no manure—no carbon—has been given to it as nourishment? and how it happens that the soil, thus exhausted, instead of becoming poorer, becomes every year *richer* in this element.

A certain quantity of carbon is taken away every year from the forest or meadow, in the wood or hay (which he has just before proved to be in each case about one thousand pounds weight) and, in spite of this, the quantity of carbon in the soil *augments*; it becomes *richer* in *humus*. Plants do not exhaust the carbon of a soil, in the normal condition of their growth; on the contrary, they *add* to this quantity. Substances, containing a large proportion of carbon are excreted by the roots and absorbed by the soil. Through the expulsion of these matters unfitted for nutrition, therefore, the soil receives again the *greatest part* of the carbon, which it had at first yielded to the young plants as food, in the form of carbonic acid. The leaves of trees which fall in the forest in autumn, and the old roots of grass in the meadow, are likewise converted into humus by the same influence; the soil receives *more* carbon in this form than its decaying humus has lost as carbonic acid.'

Liebig clearly says that the excrements of the plant alone, if the whole vegetable structure were carried away, would *nearly* replace the humus extracted from the soil; and that by the fall of the leaves in autumn, and the rotting of the roots, the soil would be *enriched*. It would therefore appear to be most evident that the author of the present Essay is correct in his suggestion, and that the ploughing in of the green matter annually would enrich the soil to any extent wished for.

Supposing, however, that Liebig's assertion is disputed, and that the soil is actually poorer by the quantity of vegetable matter carried away in the sugar cane, the deficiency can be easier supplied by the author's plan than by the present system of manuring once in four or five years. An equivalent for the canes carried away should be ploughed in annually in the shape of long tops, &c., instead of these being allowed to rot on the surface, and exhale into the atmosphere. The question naturally results, what is an equivalent? I have made a rough calculation in the following way: A pound of sugar is obtained from a gallon of juice. A gallon of juice weighs about ten pounds. A sugar cane gives (according to a careful trial made some years ago by a friend of mine) one third of its weight in trash, and two thirds in juice. A ton of sugar is therefore obtained from fifteen tons of canes, of which five tons constitute the trash; and which five tons, according to our present supposition, are to be ploughed into the soil. Every planter will admit that the vegetable matter on a newly cut cane piece amounts to far more than five tons to an acre, and that that quantity per acre can be easily ploughed in. Under any supposition, therefore, the suggestion appears quite practicable. Let us now see if the other suggestion prove also correct.

On this point, Liebig says, 'Air, water, and the change of temperature prepare the different species of rocks for yielding to plants the alkalies which they contain. A soil which has been exposed for centuries, to all the influences which effect the disintegration of rocks, but from which the alkalies have not been removed, will be able to afford the means of nourishment to those vegetables, which require alkalies for their growth, during *many* years; but it must *gradually* become exhausted, unless those alkalies which have been removed are again replaced; a period, therefore, will arrive, when it will be necessary to expose it, *from time to time*, to a further disintegration, in order to obtain a new supply of soluble alkalies. *Fallow* is the term applied to land left at rest for a further disintegration. It is the greatest possible mistake to suppose that the temporary diminution of fertility in a soil is owing to the loss of humus; it is the mere consequence of the exhaustion of the alkalies.

"The *Fallow-time*, as we have already shown, is that period of culture, during which land is exposed to a *progressive disintegration*, by means of the influence of the atmosphere, for the purpose of rendering a certain quantity of alkalies capable of being appropriated by plants. Now, it is evident, that the careful tillage of fallow land must *increase and accelerate* this disintegration."

The author, by his process of summer fallowing, has shown the cheapest and easiest way of replacing the alkalies taken away in the sugar cane. He supposes that summer fallowing will *replace* the quantity carried away, which amounts to about eighty pounds weight for each hogshead of sugar made. He has no means of ascertaining the quantity that a summer fallow is capable of separating; some more experienced party may be able to ascertain this point; but if it should not be sufficient, he has indicated the way in which the difficulty is to be obviated, by returning the stokehole ashes to the land. These cost *nothing*, and can be applied as cheaply and as easily as any other manure. They contain all that is essential to be returned, for the best possible manure for a plant, is that plant itself, whether *green*, *dry*, or in the shape of *ashes*.

To proceed with the rattoon cultivation. 'The excrementitious matters, as deposited in the soil, are injurious to the cane, and this is one reason why the cane, hitherto, has continued to decrease in luxuriance year after year, as the excrements increased, until they increased so much as to destroy the plant. The soil in reality, was not poorer than before, but the matter that ought to be the food of the plants had changed its shape, and become injurious. Ploughing, by exposing these excrements to the action of the oxygen of the atmosphere, causes a chemical action to take place, which reconverts them into nutritive matter. By the process proposed, we add nutritive matter to the soil, and we render innocuous what was before noxious matter. At the same time a considerable quantity of the ashes of the plant, from the dry vegetable matter burned, are returned to the soil to be ready for going through a similar course of re-organisation, and the green vegetable matter is returned in the shape of charcoal, which is also a valuable addition to the soil, from its attraction both of carbonic acid and ammonia.

"By the process of allowing the trash to rot on the surface of the soil, nearly all was lost in the shape of carbonic acid, by passing off into the atmosphere; a very small part only being absorbed by the leaves during the growth of the canes. But, by our process, we return a large part at once into the soil, where it comes into imdiate play.

'When treating of manure I alluded to the use of charcoal; I considered it, more properly speaking, as a corn crop manure, but conceived that it might prove beneficial in moderate quantities, more especially in dry districts. By the plan proposed of laying out the beds, we have an opportunity of increasing or diminishing our supply of charcoal, which we cannot do, if the cane pieces are arranged and cut as at present. Parties must judge for themselves of the nature of their soil and climate, and of the advantages or disadvantages of the use of charcoal as a manure, to determine the proper time for burning off the trash. If they delay the operation until the trash is all dry, they will have no charcoal, but all in the shape of ashes. I should recommend the course I have already indicated."

Charcoal has an effect similar to animal manures in furnishing nitrogen in large quantities to corn crops. It has been objected against the author's plan, though without an attempt at proof, that it would not furnish nitrogen in sufficient quantity for the luxuriant growth of the cane. But if charcoal can furnish nitrogen sufficient for corn crops, surely it can furnish nitrogen sufficient for canes; and here we have the means shown of exactly adapting the supply to the demand, by annually adding charcoal to the soil till it is brought to the state and condition best suited for growing large and saccharine canes.

"Burning off the trash has hitherto been objected to as an injurious practice. It is an injurious practice where not followed by the plough, as although the ashes are a temporary stimulus and, cause the young sprouts to grow freely, the ground is so much exposed to the sun that it becomes caked like a brick, and so hard that the roots cannot penetrate it. When, however, the land is frequently ploughed after the operation of burning off, the result will be quite different, and proves the plan to be advantageous."

The subsequent cultivation being by the hoe-plough and the horse-hoe, as in the case of the plants, need not be again described.

To those who do not like the system of burning off the trash, I would suggest the system of rattoon cultivation as described for hilly land. 'In rattoons the trash should not be burned off, but as soon as it is half rotten it may be hauled on alternate rows, and the intermediate ones be ploughed with the little ploughs and two cattle. The double quantity of trash accumulated on the one row will keep down the grass and weeds with less than the usual quantity of labour; whilst the other row will be pulverised by the plough and enriched by the action of the atmosphere. The next year the rows should be changed.'

In either case the cultivation of the cane by agricultural implements is shown to be both easy, cheap, and beneficial. The second and fifth Essay also propose beneficial methods of cultivating rattoons by chopping or cutting the body of trash with knives and ploughing it in. But the burning off the greater part of the trash as proposed in the present Essay, would enable parties to plough in the remainder without any machine for cutting it up.

'The last requisite for a successful Essay remaining to be noticed is, that the different varieties of manure should be discussed, and their relative merits and cost stated.' This, as I stated in reviewing the third Essay, is more fully performed in that than in any of the other Essays. From the peculiar views held by the author of the present Essay, it became unnecessary for him, not intending to recommend the use of them, to enter into a discussion of them.

As manuring, in the broadest acceptation of the word, is the point of the greatest importance in the cultivation of the cane, and is the one which has excited the most controversy, I will now proceed to consider our author's view of the subject.

'Of manure, according to the common acceptation of the word, that is, a mixture of animal and vegetable matter in a state of decay, I propose to do away the application. Animal manure I shall show is injurious. Vegetable matter alone is the proper manure for canes.

Of vegetable matter there is generally a sufficiency in the soil, or, if not, the quantity may be increased to almost any extent during the course of cultivation. And herein lies one of the greatest advantages of the system I propose, that the land can be annually enriched without any expense in the application of the manure used, beyond the simple expense of cultivation pursued.'

The author proposes to do away with the expense of manuring altogether by his system, and yet to enrich the land to an unlimited extent. He proposes to retain all the advantages and do away with the disadvantages of the present system of manuring; to increase the luxuriance of the cane, and yet not to make it rank, or encourage the formation of molasses. If his system prove to be correct, it will, therefore, be attended with the most obvious advantages, and therefore the attention of the reader is most particularly called to the consideration of this most important point.

What is the present system of manuring? Let us consider. We will suppose the cane land to consist of one hundred acres, and that it is replanted once in five years, or that, in other words, you manure and plant twenty acres a-year. In manuring the twenty acres by fly penning, and the same argument will apply to standing pens, you carry the cane tops from the eighty acres of cane land, as fast as the canes are cut, to the twenty acres of land you are manuring; the produce in fodder of the eighty acres is added to that already on the twenty; and, of course, the twenty acres are enriched: they have now the manure belonging to the hundred acres of cane land. You plough and plant the twenty acres, and congratulate yourself on the luxuriance of your plants. But does it not strike you—is it not self-evident—that to whatever extent you have enriched the twenty acres, you have impoverished the eighty acres? You have manured the twenty, but have you not unmanured the eighty? Is your cane field, taken as a whole, enriched? Evidently not. You have not added one single pound's weight of manure to your canes, You have gone to the expense of carting your manure from one cane-piece to the other, backwards and forwards, in the regular routine of work, but your labour has been in vain, you have not benefitted your land in the smallest degree.

Perhaps you will admit that with regard to the vegetable matters carried from one field to another, my argument is correct, but that you think the land is improved by the animal manure dropped by the cattle. This leads to the consideration of the difference between animal and vegetable manures. This appears to me to be very simply explained by saying that animal manures are vegetable manures in a concentrated form. " All flesh is grass," and the manure of animals is only that part of the grass consumed that is not required at the time for the use of the body. Supposing that a certain number of stock are constantly fed on a certain portion of land, and that, for the sake of argument, they do not increase in weight; in a certain length of time they consume the whole fodder; what becomes of it, since for argument's sake, we have admitted that the cattle do not grow fat? It has dropped from them in the shape of dung; the vegetable matters collected from a large surface of land, have been concentrated in the animal's laboratory, and are returned to the soil in small quantities at irregular spots: these spots are enriched, but the land generally is impoverished.—The same real amount of manure, equally distributed in a diluted form by the hand of nature over a large surface, is now irregularly spread in a highly concentrated form. The whole object of a good system of cultivation is to take care to collect all these matters carefully, and re-distribute them equally to the land, that it may not become deteriorated in luxuriance: such, at least, is the case in European agriculture, where the fattening of stock forms a chief part of the farmer's business, and where, from the nature of the climate and other causes it is not advisable to pasture the stock on the land. But we are placed under very different circumstances, and what may be a highly proper mode for them may be disadvantageous in our case. The collecting and re-distributing the dung, is a difficult matter to perform, and is attended with very considerable labour and expence.—If it is absolutely necessary to carry away the fodder from the cane land, for the purpose of feeding the stock, then this difficult and troublesome system must be had recourse to; but supposing that the stock can be kept in equally good, or in better condition, by being constantly fed in the guinea grass pieces or common pastures, then it must clearly appear that the labour and expen~~se are~~ superfluous, and that the plan is unattended with any good results.

That these matters having been once carried away, should be returned again is undoubtedly most necessary, but is it necessary to carry them away? The present Essay says, No—it says, in substance, carry them not away, but apply them in a diluted form, as nature has equally distributed them over the land, and save, first the expense of collecting them, carrying away, and returning them; and then, the difficulty of fairly and equally re-distributing them. Our author says feed your stock constantly in your pastures; if you never carry away your long tops, you will never have any to return to the land; and apply the whole on the spot where they grow.

Some people may say, that by penning the stock at night you get the benefit of the dung from the food consumed in the pastures during the day : yes ; but you counteract the benefit by causing the cattle to drop, during the day, in the pastures, what they consumed in the pen at night ; and the day and nights being equal in length, the profit and loss are about equal. You might obviate the carrying away to the pastures of the manure by not giving the cattle any food to eat in the pen, but, although this would enrich the land to some extent, few, I think, would advocate such a system.

There is another view of the case yet to be discussed, and this is the foddering of the pen with Guinea grass. This is a clear increase of manure, and it remains for parties to decide how far it is advantageous to unmanure the grass pieces for the purpose of manuring their cane-pieces. It is very clear that for whatever benefit you do your cane land, you injure your grass land to exactly a similar amount ; and grass land for feeding stock is just as valuable and necessary as cane land for making sugar.

So far then the principle of the Essay appears quite correct. Carry nothing away either from the cane pieces or grass pieces, but let the manure be applied to the cane pieces where it is, and let the cattle have the benefit of the grass pieces, thus neither the one or the other will become impoverished.

As to the nitrogen of animal manure ; it all comes from vegetable matters. There is a certain quantity of nitrogen in an acre of vegetable food, say a hundred pounds ; by ploughing in that vegetable food into the soil, that hundred pounds is equally distributed over that acre of land : but collect the fodder from that acre, and pass it through the stomach of a cow, and that hundred pounds of nitrogen becomes concentrated in a small compass, but there is really no more than the hundred pounds of nitrogen after all. By leaving the nitrogen spread over the acre of land, you are following the example of nature, and furnishing it to the young plant exactly in the proportion to the carbon in which it existed in the old plant. It appears almost certain, from the arguments adduced in the Essay, that by concentrating and accumulating the nitrogen, you are frustrating the object of nature, and furnishing a substance to form molasses, and not sugar.

With regard to the green crops. Much has been written on the subject. The cane is the proper green crop for the cane. What is the action of a green crop ? You wish to apply some vegetable matter in the green state to the soil. In doing so, you add nothing to the soil, except the organic parts derived from the air, but what has come out of the soil. Whether you grow canes and plough them in, whether you grow peas, guinea corn, lucerne, or any other plants and plough them in, you add nothing to the soil, except the two same matters which all plants derive exclusively from the atmosphere, and which are called the organic parts of plants. The inorganic parts are derived exclusively from the soil; one plant extracts one thing and one another thing, but whatever it is, it matters not, it comes out of the soil, and you return it again; you add no inorganic materials, but what were already there. The only real addition to the soil, then, is the organic part, which forms nearly the whole bulk of the vegetable structure, and is derived exclusively from the atmosphere; and this the cane itself furnishes in far greater quantity than any of the green crops recommended as the substitute for it.

A calm consideration of the subject makes the matter appear to me now, although I was long enough puzzled at it myself, almost ludicrous, so simple does it appear. Every acre of every cane piece in the island contains tons and tons of a green crop, and yet, because it is not called a green crop, it is looked upon with contempt. We puzzle ourselves how to get rid of this, as we suppose useless incumbrance; it stops the use of the plough; it is always in the way; it is in such quantities that we don't know how to get rid of it; we burn it; we allow it to rot, and all the virtues of it to evaporate in the atmosphere to enrich our neighbour's lands, or to be wafted to distant parts of the world; and all because it is not called or known to be a green crop. Having, to the best of our abilities, got rid of it, we wisely determine to have a green crop as the best means of enriching the soil, and we plant peas, we plant guinea corn,, we plant any thing we like; no matter what the trouble or expense is, a green crop we must have; and at least a green crop we get certainly, but at a great expense, and in quantity and value, perhaps a tenth or a twentieth of the one we have despised and wasted. We exchange dollars for shillings, and congratulate ourselves on the profitable bargain we have made! Is this wisdom or economy?

Immediately after cutting a cane piece, an immense mass of trash is found covering the surface of the land, and weighing many tons to the acre. A part of this, say one or two tons, is picked, and carried away as feeding for the stock; what becomes of the remainder? Visit the piece six or eight months afterwards, and nearly the whole of this large mass of vegetable matter is found to be as completely gone as if it had been burned at first; it is dissipated as thin gas into the atmosphere; and this during the young growth of the cane sprouts, which have not leave to imbibe a twentieth part of it. Would it not be better to burn off the half or three quarters, and plough the other half or quarter, thus bringing the gases in direct contact with the roots, and helping to force the canes forward to maturity. Guinea corn, according to Mr. Heighington, gives three tons of vegetable matter to be ploughed in. Guinea grass gives a great deal more. Some that I tried some years ago, being fresh planted, weighed as much as twenty tons to the acre, but after being cut a few times it falls. off much in quantity. Peas I have no means of knowing the weight of, but it is not considerable. But none of them give anything like as much as the cane itself in the shape of a green crop.

Such are the views of the author of the present Essay. Are they correct, or are they incorrect? Surely they are deserving of consideration, and, if incorrect, worthy of refutation. Here is a doctrine brought forth on the most important point of agriculture, completely at variance with public opinion; it has been months before the public, and not one of that public—that agricultural public—has yet come boldly forward to grapple with the subject. It is for the interests of agriculture, as well as for my own credit, that I ask for a decision on the subject by competent parties. Surely there are such to be found in the country, and surely they are not ashamed or afraid to express their opinions on such a momentous question, whether in favor of or against the theory.

Mr. Cargill, in his Prize Essay, comes nearly to my view of the case. He says, 'Pure sugar being a compound of the elements of carbon, oxygen, and hydrogen, it is easy to see on what the richness of cane juice must depend. Every thing, but these elements, which is found in cane juice, constitutes an impurity, which requires to be removed in clarification. When we are told, then, by chemical agriculturists, that nitrogen in the manure, causes gluten and vegetable albumen in a plant, we understand why an excess of animal manure is rather injurious to sugar, and may learn that, although animal manure is necessary for the formation of the leaves and woody fibre of the cane, a very small quantity is sufficient, and probably not more than enough to cause putrefaction of vegetable matters in the soil. We must consider carbon as the ingredient to be supplied to the cane, with a view to the perfection of its juices."

Mr. Henney, in his second prize essay, which I must do him the credit to say is a very excellent performance, and which is so far superior to his first, that nobody would believe it the production of the same pen, if it were not for his still partially upholding some of his former practices. Mr. Henney, I say, endeavours to soften down my proposition. He suggests, 'that should it be proved that Liebig is mistaken (as to the quantity of ammonia existing in the atmosphere), it will follow, that vegetables being *deficient* in nitrogen, are incapable of furnishing that constituent of plants in sufficient quantity, for the extended development, required to yield large crops, which must therefore be got from animal substances.' But, I would ask Mr. Henney where does the nitrogen in animals come from? does he corn-feed his cattle? or is all the nitrogen they yield in their dung derived from the green food on which they live? There is no other source from whence the cattle can derive the nitrogen, and therefore the ploughing in of the vegetables in the green state will furnish as much nitrogen as if it were passed through the cattle, and made manure of.

He himself admits that but a small portion of nitrogen is advisable in cane cultivation. "It must be observed, that the formation of too much ammonia in the manure is not desirable, for, on the authority of the best agricultural chemists, it appears, that nitrogen, the great basis of ammonia, however favorable to the development of plants, is *inimical* to the formation of sugar in their juices, and the experience of every planter will tell him, that the sugar from canes grown in rich gullies, is always dark, and the cane juice poor, taking nearly double the quantity to the hogshead, that it does when the canes are of a less rank growth." Again he says, 'But the supply of nitrogen by the ammonia of animal manures, should not be in such excess as to produce rankness, and thus render the sugar in the juices uncrystallisable, but only in such quantity, as will by increasing the roots, give to the plants greater power of assimilating the amount of carbon necessary for their nutrition." Whence comes this change o'er the spirit of his dream? Did his first Essay say this, or has he been taking a leaf out of my book? Having met me half-way, I shall now expect to make a complete convert of him.

In his subsequent quotations from Liebig, he puts a wrong interpretation on his words, which it is necessary to rectify, as he endeavors to prove from Liebig's words what Liebig never intended to assert in fact just the reverse of what he explicitly asserts. "Even should Liebig be right," says Mr. Henny, 'that ammonia exists in sufficient quantity in the atmosphere for plants in a state of nature, it by no means follows that the cane will not require a further supply, to secure a larger development for its profitable cultivation; in effect, Liebig says so—his words are, "However abundantly humus, carbonic acid, and other substances may be supplied, a plant cannot attain its full developement without *plenty* of nitrogen," and again, "In a state of cultivation, the object of which is the extraordinary development of the most useful parts, the seeds and *roots*, they require larger supplies of nitrogen, than the ammonia afforded by rain-water, which must be furnished by means of manure."

Although I have searched carefully, I cannot find such extracts in Liebig, but presume it is intended to be part of the following passage, and which proves just the reverse. 'We have now considered all that is requisite in a soil, in order to furnish its plants with the materials necessary for the formation of the woody fibre, the grain, the roots, and the stem, and now proceed to the consideration of the most important object of agriculture, namely the production of nitrogen in a form capable of assimilation—the production, therefore, of substances containing this element. The leaves, which nourish the woody matter, the roots from which the leaves are formed, and which prepare the substances for entering into the composition of the fruit, and, in short, every part of the organism of a plant contain azotised matter in every varying proportions, but the seeds and roots are always particularly rich in them.

"Nature, by means of the atmosphere, furnishes nitrogen to a plant in quantity sufficient for its normal growth. Now, its growth must be considered as normal, when it produces a single seed, capable of reproducing the same plant in the following year.

"We may furnish a plant with carbonic acid, and with all the materials which it may require, we may supply it with humus in the most abundant quantity, but it will not attain complete development, unless nitrogen is also afforded to it; *herb* will be formed, but no *grain*, even sugar and starch may be produced, but no *gluten*."

What can be plainer than this, that the whole bulk of the vegetable will be brought to complete perfection, without the use of animal manure; but that seeds, such as corn, will not be formed for the food of man, and that roots, such as turnips, will be deficient in gluten and nutritive power for the food of animals, without the assistance of animal manure. And what ought to be the object of our cultivation of the cane, but to produce *sugar* and *gluten*, alias molasses? Not a word here about the *plenty* of nitrogen required. And surely Mr. Henney is not prepared to say that the *roots* and seeds of the cane are the most useful parts, and yet the word 'roots' appears in italics.

In considering the theory of manuring, we have so far omitted to notice the method in which an equivalent value must be returned to the soil for the sugar canes carried away. We have hitherto only considered the relative merits of the different systems of manuring, which the carrying away of the canes would equally effect. The soil suffers an injury yearly to the extent of the canes carried away, and this must be replaced, or the land gradually deteriorates. Of what does a sugar cane consist? Simply, as all other vegetable structures, of organic and inorganic matters, and water. Upon grinding the cane, the sweet juice which consists of water and sugar, is separated; the water is subsequently evaporated, and the sweets alone remain. These do not contain any inorganic matters, and are therefore not derived from the soil. All the earthy particles or inorganic matters, which are extracted from the soil, and which are essential to be returned, remain in the cane trash; and after the trash is burned, are found in the ash pit as ashes. These, upon trial, I find to be about eighty pounds weight for every hogshead of sugar, and it is therefore essential that for every hogshead of sugar made per acre, eighty pounds weight of ashes should be returned to the soil. In practice the stokehole ashes never are returned, and this appears to be the chief reason why cane land is said to be worn out. The only way in which the deficiency appears hitherto to have been supplied is, in foddering with guinea grass or other food not grown on the cane land; and lately by the importation of manure. The author of the fourth Essay supposes, that from the constant tillage he recommends, a sufficiency of fresh alkalies and earthy matters would be obtained without returning the stokehole ashes. The chief use of ploughing and summer fallowing being proved to be the disengagement of these matters from the soil, such a result would probably prove to be the case; it would, perhaps, be more prudent, however, to return them as well as the ashes from the still-house. Indeed, considering the length of time during which canes have been carried away, and no substitute returned for them, and that land has never been pulverised or properly fallowed, it would appear that the most valuable manure that could be applied to the soil at the present time would be a large dose of wood or vegetable ashes. The author's system would then continue to keep the land in perfect heart.

From the large quantity of wood used in burning lime there is no doubt that the action of lime would be generally advantageous, on account of the ashes mixed with it, independently of its own beneficial chemical properties. The application of ashes and lime would also, I have no doubt, make the canes grow more erect, and without lodging so much as at present.

If the views of the nature of manure as disclosed above prove to be correct, then is the author's system of cultivation the most simple, cheap, and beneficial that can be adopted.

Next in importance to the author's view of the proper mode of manuring, is the view he has taken of the action of animal manures in the formation of molasses. If his system of manuring is found to be right, it would be superfluous to open the present question, as no such injurious results could follow. But as the question is already started it ought to meet with due consideration.

" From a careful perusal of the subject of humus in Liebig's work, and from the consideration of the real nature of the food of plants, and the manner in which they are nourished, I think every unprejudiced reader must have arrived at the same conclusion as myself, namely, that the application of solid manure (that is the black decomposing matter in a dunghill, impregnated with urine,) is unnecessary in the cultivation of the cane, and that liquid manure is highly injurious.

" Whilst on the subject of manure, it will be well to call the attention of the reader to the difference between the objects of British and West-India cultivation. The object of British Agriculture is to obtain the greatest quantity of nitrogen both as seed in their corn crops, and also in the leaves of their green crops, which are for the same purpose, for the food of man and animals, as it has been demonstrated that food is nutritious just in proportion to the quantity of nitrogen contained in it. The object of our agriculture, on the other hand, is to have the smallest quantity of nitrogen consistent with the constitution of the vegetable structure of the cane, but a large excess of carbon, in proportion to the nitrogen, as then the surplus has been demonstrated by Liebig to go to the deposit of sugar in the cellular tissue. It is well known that sugar is simply carbon combined with the elements of water, so that it will be easily conceived that the surplus carbon will be converted into sugar.

" A soil rich in decaying vegetable matter will always extract sufficient nitrogen from the atmosphere necessary for the perfect development of a green crop like the cane, although not sufficient for a corn or seed bearing crop.

" Whilst on this subject I must beg the readers to refer again to that part of Liebig, where the effect of animal manure is exhibited on beet root and potatoes, the two crops most nearly approaching to the sugar-cane. It will be found that liquid manure is injurious to both, and that the quality of beet-root sugar is the best when grown on barren sands. See also the injurious effects of animal manure in the boiling of beet-root sugar, showing that the juice that would otherwise make sugar becomes converted into molasses, an effect which we often experience in boiling the juice of manured plants.

The starch of the potatoe and the sugar of the sugar-cane, are both formed in a similar manner ; in fact, so little difference exists between the two products, that by a simple chemical process, pure starch is converted into pure sugar. The arguments therefore against the use of manure for the beet root and potatoe apply with equal force to the cane.

" The chief use of solid animal manures is in their returning to the soil the inorganic constituents of plants derived from the soil.—We have the power of returning all these matters to the soil in a much simpler and cheaper way ; namely, in the shape of ashes from the stoke-hole or the still-house.

" But the reason why the solid animal manures are not advisable as manure for canes is from their being impregnated with urine.

" Liquid animal manure, being rich in nitrogen, makes the cane rank and luxuriant, but not saccharine. Sugar contains no nitrogen, but molasses does ; liquid manure therefore forms molasses at the expense of the sugar. It is well known that canes, heavily manured, will scarcely make sugar, but yield abundance of molasses on boiling."

Now, here is a theory proposed that you might suppose would have attracted the attention of the scientific ; it must be either right or wrong ; but whichever it be, you would suppose that in an agricultural community like this, and one containing many scientific men, such an opinion would have been proved long ere now, either as radically wrong or intrinsically good ; but although such a novel proposition, and one by which the planter is so intimately affected, no scientific man has yet stepped forward to express an opinion.

From our own experience as planters, we all know that rattoons give better sugar and less molasses than plant canes. What is the reason ? Can nobody answer ? Is it, as the author supposes, from the excess of nitrogen being got rid of in the plants. Surely the matter is worthy of investigation. As the author refers to Liebig, let us see what he says on the subject generally, but more particularly on the cultivation of beet-root and potatoes, as these are the two European crops most nearly assimilating to the cane, and of the effect of animal manures on them.

" Woody fibre, starch, sugar, and gum, are compounds of carbon with the elements of water. Nitrogen is an element of vegetable albumen and gluten." Sugar being a compound of carbon and water, contains no nitrogen; molasses, on the other hand, contains gluten, and therefore nitrogen, for molasses and water will enter into vinous fermentation, which no liquid not containing gluten will do.

"The nitrogen of putrified animals is contained in the atmosphere as ammonia. Ammonia is of extreme solubility in water. Ammonia, therefore, cannot remain long in the atmosphere, as every shower of rain must condense it, and convey it to the surface of the earth. Hence, also, rain water must, at all times, contain ammonia, though not always in equal quantity.

If a pound of rain water contain only one fourth of a grain of ammonia, then a field of forty thousand square feet must receive annually, (calculated from the usual fall of rain), upwards of eighty pounds of ammonia, or sixty-five pounds of nitrogen. This is much more than is contained in the form of vegetable albumen and gluten, in 2650 lbs. wood, 2800 lbs. of hay, or 200 cwt. of beet-root, which are the yearly produce of such a field; but it is less than the straw, roots, and grain of corn, which might grow on the same surface, would contain."

Thus we see that rain is the medium of furnishing ammonia where liquid manure is not used, and that the ammonia of the atmosphere is sufficient for such green crops as wood, hay, or beet-root, but insufficient for corn crops. Liebig goes on to say, " In the manufactories of beet-root sugar, many thousand cubic feet of juice are daily purified with lime, in order to free it from vegetable albumen and gluten, and it is afterwards evaporated for crystalization. Every person, who has entered such a manufactory, must have been astonished at the great quantity of ammonia which is volatilized along with the steam. The free acid which is thus formed is a source of loss to the manufacturers of sugar from beet-root, by changing a part of the sugar into uncrystallizable grape sugar and syrup."

Having shown that the atmosphere furnishes a sufficiency of nitrogen for beet-root; having shown that nitrogen forms albumen and gluten, and having shown that the great obstacle in boiling beet root sugar is the getting rid of the gluten and albumen contained in the juice; the conclusion appears obvious that animal manure, the great source of nitrogen, is injurious to the formation of sugar, and that it tends to form molasses. To prove that the nitrogen is contained in excess in animal manure, see what he says on the subject.

'The employment of animal manure in the cultivation of grain, and the vegetables which serve for fodder to cattle, is the most convincing proof that the nitrogen of vegetables is derived from ammonia. An increase of animal manure gives rise not only to an increase in the number of seeds, but also to a most remarkable difference in the proportion of the *gluten* which they contain.

'Wild plants obtain (and I argue that the cane does the same) more nitrogen from the atmosphere, in the form of ammonia, than they require for their growth. Cultivated plants receive the same quantity of nitrogen from the atmosphere as trees, shrubs, and other wild plants, but this is not sufficient for the purposes of agriculture. Agriculture differs essentially from the cultivation of forests, inasmuch as its principal object consists in the production of nitrogen under any form capable of assimilation, whilst the object of forest culture is confided principally to the production of carbon."

Now, my argument from the above is, that as sugar contains no nitrogen, but only carbon, our object should be to manure the cane with carbonaceous rather than nitrogenous substances; in other words, that we ought to use vegetable and not animal manures. See again what he says—

'A superabundance of carbon in the state of carbonic acid conveyed through the roots of plants, without being accompanied by nitrogen, cannot be converted either into gluten. albumen, wood, or any other component part of an organ; but either it will be separated in the form of excrements, such as *sugar*, starch, oil, wax, resin, mannite, or gum, or these substances will be deposited in greater or less quantity in the *wide cells* and vessels." Here is exactly the thing we want, a method of increasing the deposit of sugar; it was what induced the author to do away with the application of animal substances. Surely there must be some truth in the matter. But let us follow Liebig still further, and see what he says.

'The quantity of gluten, vegetable albumen, and mucilage, will augment when plants are supplied with an excess of food containing nitrogen; and ammoniacal salts will remain in the sap, when, for example, in the culture of the *beet*, we manure the soil with a highly nitrogenous substance, or when we suppress the functions of the leaves, by *removing them from the plant.*'

Thus we see that supplying an excess of nitrogen, as we do by fly-penning land, forms molasses instead of sugar, and that trashing the green leaves off the cane has also a similar effect.

With regard to the potatoe, Liebig says, 'The quantity of starch (equivalent to sugar) in potatoes increases, when the soil contains much humus, (or decomposing *vegetable* matter) but decreases when the soil is manured with strong *animal* manure, although then the number of cells increases, the potatoes acquiring in the first case a mealy, in the second a soapy consistence. Beet roots, taken from a *barren* sandy soil contain a *maximum* of sugar, and no ammoniacal salts.' Thus we see, that when no manure is applied, as in the last case, the nitrogen furnished by the atmosphere goes to form the cellular tissue, and that there is no excess to remain in the sap and form molasses ; but that the excess of carbon furnished also by the atmosphere, all goes to form sugar alone.

Having shown as far as I am able that the theory is correct, let us see how far we can refer to our own practice for confirmation. What is considered to be the largest yielding land ? Planters will say, virgin soil. And what is virgin soil, but land rich in humus or decaying vegetable matter, and without any animal manure ? Does not this kind of land give the largest returns of sugar known ? And is not this a strong confirmation of the correctness of our author's theory ?

With regard to trashing. Our author strongly advocates the giving up of the practice as injurious ; let us see what reasons can be assigned for so doing. In reviewing the practical part of the Essay, strong facts were brought forward in support of the author's recommendation. Let us now consider the subject more theoretically.

'Liebig demonstrates that the sugar is not deposited by the leaf until it arrives at complete maturity. In trashing there are always a number of them pulled off long before they came to maturity—quite in the green state ; the sugar therefore in the joint cannot arrive at its proper state, but may be considered to be in the state of molasses or imperfect sugar.'

From his own experience and that of his neighbours the author proves trashing to be unnecessary. He proves that in the East Indies the leaves are carefully tied on the canes ; that in Demerara it is not practised ; and in the present letter he shows that in Barbados and Saint Kitts it is also never done. In Demerara, no manure is used ; in Barbados, and Saint Kitts, the manure is chiefly vegetable matter. Mr. C. says in his notes on Barbados. 'When the lands are being replanted, it is usual in preparing them to cart as much as one hundred tons to the acre of fresh mould on them from the bottoms of gullies. Besides the hundred tons, more or less, of mould, about forty loads of dung is considered a good manuring.' The estate he visited had only ninety head of stock to manure forty acres of land, so that the proportion of animal to vegetable manure is very small. According to our way of reckoning, even if the cattle were penned every night, this would only give 820 to the acre ; while our usual calculation is 2000. Mr. Caines says, ' The stakes to which you tie your cattle should be ten feet distance from each other, and you should never suffer them to remain more than a night and part of a day in the same spot.—Double this time is, I know, generally allowed, for the manuring of land by staking. But the period is too long, unless you suffer the land, where your cattle have been staked to be robbed of its animal salts and richness by remaining unholed and exposed to the absorption of the sun, for months after the cattle are removed.'—Now, at the rate of one cattle for ten feet posts, by our calculation, the manuring would be only 435 per acre. And yet. both in St. Kitts and Barbados. the yielding of plants is reckoned three hogsheads an acre. They are, however, very careful in collecting mould and all kinds of vegetable matters, and apply them at a much earlier stage of decomposition than we do. These facts bear strongly in favor of the suggestion in the Essay, that trashing is only the means of checking the over-luxuriance caused by an excess of animal manure, and that if vegetable manure was used, trashing would be as unnecessary for plants as it is now acknowledged to be for rattoons.

The only thing yet in the shape of an answer to the author's suggestion of doing away with trashing, is a short paragraph in Mr. Price's letter from Worthy Park.

'I am afraid that the new doctrines as to manuring and trashing canes producing *molasses*, and not sugar, would receive nearly a death blow from these facts, for I believe that few estates have manured and trashed their canes, so much as we have.

' The vast returns from Worthy Park have been too much attributed to our certainty of favorable seasons, and most undoubtedly they have had much to do with it, but a very slight knowledge of this vale would convince any one, that the returns are rather to be attributed to the system pursued, namely, the judicious application of an abundance of manure, the keeping the canes clean, and the frequent trashings.'

Is this to be the death-blow to Barbados? Is it to be the death-blow to the practice of St. Kitts, of Demerara, and of the East Indies? I guess not: I do not myself feel half killed by it, weighty as is my antagonist's blow. The Essay states trashing to be the means of remedying the over-luxuriance of manured canes, and admits that 'on manured land, and in rainy weather, canes should be lightly trashed till they are lodged.' I believe his district to be unusually rainy, and therefore it may be advisable to trash the canes, when in drier districts it would be the reverse.—Again, we do not know with how much vegetable matter his animal manure may be diluted, or how long it remains exposed to the atmosphere, and exhaling its nitrogenous parts, before being applied to the soil. Neither do we know to what extent he abstracts the nitrogen by corn crops. Nor to what extent we are to attribute the large returns to the unusual quantity of rain and the unusual amount of weeding the canes receive, and these are two most powerful agents in producing large returns. All which is necessary to be known before a correct opinion can be formed as to whether his practice confirms or disproves the theory asserted.

This review having already reached to a much greater length than was intended, I must pass over the discussion of the many minor points of interest in the Essay. The whole will be found interspersed with much interesting information. Every practice is fully discussed, and the cost of it calculated : every alteration is more fully discussed : the implements proposed for use are simple and easy ; and the mode of cultivation proposed, is, whether considered practically or theoretically, the best, cheapest, and easiest yet laid before the public.

The author conceived that the object of the prize was to bring forth improved systems of cultivation, and not to write a history of the old one ; he therefore fearlessly brought forward every plan calculated to effect an improvement in that agriculture, with how much success the reader must judge for himself ; yet, though proposing so many and great changes, he recommended no change to be made rashly, but appealed to the understandings of his readers ; asked them maturely to consider his reasonings, and then only to try the plans at first on a small scale.

" In concluding my Essay, I beg to make a few remarks *!*

' In adapting the cultivation of the cane to the exigencies of the times, and in endeavouring to show how it may be improved by the aid of the science of agriculture, I have, in proposing a system, intended to be as perfect as possible, proposed so many alterations, that it will be advisable to say a few words on the way in which they should be carried into effect.

'This should be attempted very gradually. I have endeavoured to explain the reasons why the former practices were disadvantageous, and also why the proposed plans are likely to be the contrary. No change should be undertaken till the party is satisfied of the correctness of the reasoning ; he should observe and study for himself, and then when perfectly satisfied in his mind that he is correct, bring it into effect by degrees, as he has an opportunity.

'It is a difficult thing to effect an alteration in established practices, and too much should not be attempted at once.

'In ploughing land preparatory for planting, try a part of the cane holes at the width recommended by me, and making the furrow in the way indicated.

'If a party is afraid of the expense of laying out the beds as directed, or has not liberty to do so, let him still remember the reasons given for the operation, and make his arrangements as nearly similar as he can.

'If a party has hitherto been an advocate for trashing canes, let him try a few acres without.

'If he has a piece of first rattoon canes that was ploughed when planted, let him try the effect of tillage with the hoe-plough or horse-hoe ; or not having those instruments, let him plough it with the large plough without the mould board, while there are no sprouts to be trampled on by the cattle.

'In the same way I trust all the suggestions will be received and tried as opportunity offers. It is useful to know what is the best system of cultivation, although we cannot hope to be able to adopt it in all its details for some time, as we may thus keep it always in view, and be approximating to it.'

I have now passed under review all the Essays, and trust that I have fulfilled the good intention with which I started, namely, the doing so 'in a spirit of fairness and good feeling.'

In reviewing the Essay by Mr. Henny, to which the prize was awarded, I utterly condemned it. It was supposed by many at the time that I wrote under excited feelings, and that I was harder upon it than I should have been. No such thing. Every thing stated is perfectly correct. I have read it over carefully again, and also my review of it; and I see no reason to change my opinion in the slightest degree. Of

Mr. Henney himself, I have nothing to say, but of his Essay, I have a right to speak my mind freely. It was utterly unworthy of the prize; it was the worst Essay sent in. I have shown good points in all the others, but his contains nothing better than the usual practice; in fact, in the chief respects, it was decidedly worse than the common practice. Such I stated five months ago in the public prints, and if the practices had not been quite indefensible an attempt at defence would have been made long ago. Nor will any defence appear now, for the same reason. How the Judges came to make such an egregious mistake still remains a mystery. From interested motives it could not be. But by their wrong decision they have inflicted an injury on the other writers. They naturally expected that due care would be taken in the deliberation on their respective merits, and that the prize would be awarded to the best and not to the worst.

Having, I trust to the satisfaction of the public, proved my own to be the best, I have a more peculiar right to feel aggrieved on the occasion. Against the award of the money there is no appeal, but for the honor attached to writing the best Essay, I now appeal to the public.

Of that public, Agricola, having avowed his real name, now takes leave with many thanks for the kindly manner in which his letters have always been received. He was the first, after the termination of slavery, to bring the discussion of agricultural matters before the public. He has discussed every branch of the subject to the best of his abilities. Through good report, and bad report, he has unflinchingly advocated the interests of agriculture, but more especially of the working planters. He has now the proud satisfaction of seeing the great and noble in the land, taking the lead in the promotion of those interests he so long contended for single handed. The ship is now launched, the steam is up, the pilot at the helm; go on, and prosperity attend the good cause.

"MAY GOD SPEED THE PLOUGH."

—are the last words of

AGRICOLA.

ESSAY

ON THE MANUFACTURE OF SUGAR,

By W. F. Whitehouse, Esquire.

"Knowledge is Power"

The Manufacture of Sugar embraces the four operations o TING the canes, CARTING them to the mill, GRINDING the BOILING the expressed juice ; it will therefore be advisable sider each operation separately :

CUTTING.

The operation of cutting the canes does not appear much scope for introducing machinery, or any other metl effecting a saving of manual labour. There is a degree of s quired in the operation which no machine can be made to su Each cane requires a cursory examination by the cutter to s it is not sour or rat eaten. The unripe top part has then to off, and this too, exactly at the spot where the ripe and the parts meet; else either sugar cane, that is the ripe part, wasted with the long top, or leafy part; or a part of the unrip with its impure juices, will be sent to the mill for grindin will deteriorate the quality of the sugar.

At the same time, if the tops are required for planting, tl ters must cut them off at the requisite length, and throw tl heaps to be tied up and carried away, and this operation r also skill and attention on the part of the operator. Unripe ers must, at all times, be rejected by the cutter as unfit for sugar. There is also usually a considerable quantity of dry t leaves adhering to the canes, which the cutter must strip running the back of the bill-hook along the canes. None of operations can be imitated by a machine.

The cutter have cut the canes close into the ground, and having cut off the green end of the top and the plant top, cuts the sugar cane into one, two, or three lengths of about three or four feet each, for the convenience of tying up, and throws them in a regular row behind him. Two, three, or four cutters, according to the abundance of the cane, throw into one row, which is then tied up by a person following, who heaps up the bundles at short distances, throwing them halfway to the next person tying, who also throws his bundles halfway to make a joint heap. By this means the carts have room to drive among the caneheaps, which otherwise is not the case. If the canes are not heaped up, many of them are loosened by the cattle trampling on them, and are subsequently lost, without a person is specially employed to pick them up again.

Such is the operation as commonly performed. How can all this accuracy and skill be substituted by machinery ! In the sugar-making districts of the United States, where on account of winter frosts, canes do not attain the age of more than nine months, and where the whole crop is required to be cut at once, as it were, the canes may be, and in some places are mowed down by machinery, because it does not matter about their being properly cut into the ground, as their cane stools all die. It may be supposed also, though I do not state it as a fact, that the canes being only nine months old, will all stand upright, which would facilitate the operation of mowing. How they cut off the long top I do not know, nor how the machine can be used if the canes should lodge with them, as they usually do with us from the greater age at which they are cut.

A cane-cutting machine has been tried at Hyde Hall in Trelawny, but without success, It is not possible to make a machine discriminate between good and bad canes, or cut off the exact quantity of unripe sap from the ripe cane. This part of the operation must therefore be performed by manual labour; and as the actual cutting or seperating the cane from the ground is only a small part of the whole operation called cutting, but a very small saving of labor could result from the use of a machine to cut down the canes; and this saving would in all probability be more than counterbalanced by the labour necessary to work the machine, and to remedy any bad work it may do.

The operation of cutting is usually done with a bill, but since freedom, many of the labourers use a cutlass. There is a prejudice against the use of a cutlass existing amongst planters, as they think the people do not cut the cane so close to the ground with it. I think the prejudice unfounded; the operation of cutting appears much easier to the laborer using a cutlass, as he has not to stoop so much at his work; and a cutlass gives him a much longer sweep at each stroke in cutting into a hard cane stool; and consequently the stroke ought to be not only more effective, but at the same time, easier to the laborer. Reason would be on the side of the cutlass rather than the bill for cutting canes close to the ground, which is the only reason I have heard assigned for the preference of it to the cutlass: as the easier the operation, the more likely is it to be well done. Bending the back all day at any operation is very laborious.

The expense of tying up the canes has been tried to be avoided, by carting them to the mill in the loose state, an extra person being employed to load the carts. This would save also the cane carriers at the mill the trouble of loosing and throwing away the cane bands usually employed to tie up the canes, and would keep the cane yard cleaner. Against the plan, it may be supposed that a good many canes might drop out of the cart in going to the mill. It has been tried with success at Temple Hall, in St. Andrew.

Canes are cut either by job-work, by the task, or by day-labour. Cutting by the job appears to be attended with the most advantages. In this case, the laborer contracts to cut a certain piece of canes for a certain sum of money. The same parties continue working at the job till it is finished, and then share the money. The employer has the power, if he finds any bad work done, of making the people go over it again; and this power, if he shows the people that he is determined to enforce it, by examining every day the work, as it proceeds, induces them usually to do very good work. I have seldom had occasion to find fault with the cutting of any pieces taken by the job. The disadvantage against this plan is, that the job master seldom employs a sufficient number of people to keep the mill supplied with canes. This is obviated by cutting two or more cane-pieces at the same time; and this can hardly be called a disadvantage, for it enables you to cut a piece far distant from the Works, with one close at hand, thus equalising the wain carriage, and causing a more regular supply to the mill than where only one piece is cut at a time; as, in the case of its being far away, the mill is frequently stopt for want of canes. It also enables you to cut a piece of plants with a piece of rattoons, thus equalising the work of the mill in expressing the juice, and making the task at the mill more regular for the people. It also facilitates the boiling of the sugar, the rankness of the plants being counteracted by the sweetness of the rattoons.

The people when cutting canes by the job usually work much harder than by either of the other methods, from the natural feeling of industry excited when the profits depend on a man's own exertions. In this way a fewer number of hands will keep the mill supplied with canes.

There are three ways of cutting canes by the task. The first is by giving the cutters a certain number of chains length of cane-row to cut; the second is, when they cut by the cord; and the third is, when a certain number of people are put to cut canes to keep the mill supplied day by day. The disadvantages of this system are, that you have no sufficient remedy for bad work, without you are always with them to call them back immediately it occurs. After a man once leaves his row or his cord, and any fault for bad work is found, he never will acknowledge it to be his row or cord; and the knowledge of this chance of escape induces them to be very careless in the performance of the work.

In cutting by the cord, besides the endeavour on the part of the cutters to make the heap as diminutive as possible, there is an inducement to pack up unripe and rat-eaten canes, and to leave too much of the green top on them, for the purpose of completing the task sooner.

In cutting by the chain, there is always a risk of being cheated in the number of chains; there is a risk of two people cutting one row instead of two rows, and which is often done behind an employer's back; and there is also the chance of the laborers running carelessly over their work, and leaving many canes buried under the trash, with the hopes of escaping detection.

It is impossible to examine every row, and the headmen are very little to be depended on in these cases. In jobwork every person employed can be made responsible, even should the bad work not be found out for several days; and there is no object to be gained by packing up bad canes.

The placing a certain number of people to supply the mill with canes is the third way, and is the best of the three, though still exposing the employer to the same chance of the work being badly performed from the cutter's hope of escaping detection.

This is the plan usually adopted when any of the headmen undertake the job of manufacturing sugar, which usually includes the cutting and carting of the canes. This is now done on many estates, and is a great relief to the overseer, as he has only to superintend and see that each branch of the work is properly performed. No exertion should be spared to induce parties to undertake the work, as it possesses many and great advantages: the first is that you only pay for what sugar is actually made: secondly, that it excites industrious habits: thirdly, that it prevents disputes as to the amount of work and of wages; and fourthly, that it enables the overseer to devote his attention more to the quality of the produce, the care of the stock, and the good cutting of the canes; the onus of finding people to do the work, and of keeping them at it, resting on the job-master. On many estates one man continues the contract for the whole crop.

Cutting by day labour, no sensible man would have recourse to; it is paying a premium to encourage idleness; the work done in this way amounts to a mere nothing; it is all eye-service; the people do the smallest quantity of work that they think will enable them to receive their wages.

As to the age at which canes should be cut: people are obliged to act according to circumstances, quite independent of the consideration of the real maturity of the cane. The cane-pieces cut first last year, will usually be the first cut this year, being the oldest on the list, but sometimes the routine is changed for the purpose of cutting a piece near to the works in consequence of wet weather, or to shorten the carriage on account of being for a time deficient in wains. More attention is however paid to cutting the plant canes when at their full ripeness.

If there is a long spell of dry weather during crop time, canes of almost any age will make sugar, especially ratoons. I remember cutting a piece without referring to the list, to know its age, but simply from its appearance; after commencing the cutting of it I referred to the list, and found it was only nine months old; I was thunderstruck, being only a young overseer at the time; but not liking to countermand my order, the cutting proceeded, and the result turned out better than from any other piece for the whole crop: it also made beautiful sugar. I have seen plants cut at ten months old and make excellent sugar, though very little of it.

In dry weather, from ten to twelve months old is quite sufficient for rattoons: in fact, after that, they become very hard and dry, a part of the sugar being, no doubt, converted into woody matter. The joints at the bottom of a cane contain scarcely any juice, but are nearly altogether woody matter: the upper joints contain comparatively speaking abundance of juice, and that juice seems equally sweet with the juice of the bottom part. This being the case, it may easily be supposed that the longer a cane is exposed after arriving at maturity, the less quantity of sweet it must contain.

It appears that each joint of the cane arrives at complete maturity as soon as the cane leaf withers; the last act performed by each leaf seems to be the deposit of sugar in the cellular tissue of the joint connected with the leaf. Porter, in his work on the sugar cane, describes these cells as being placed between the sap vessels, and quite unconnected with them. The sugar being deposited there, must therefore remain uninfluenced by the sap, and must remain there unchanged, unless the eye or sprout of the joint, for the nourishment of which this sugar is deposited, grow; or unless the sugar becomes gradually transformed into woody matter; or, unless the cane goes through the natural process of decay, or is crushed at the mill.

The difference between rich liquor and poor liquor, or between the liquor from canes cut in dry weather, and in wet weather, appears to be simply from the different quantity of sap contained in the sap vessels, and which must always be expressed at the same operation that expels the sweet juice. The sap is very abundant after wet weather, and containing vegetable albumen and gluten, and other matters injurious to the clarification of the juice and its conversion into sugar, as well as a large quantity of water which must be evaporated, causes the liquor not only to be much longer in evaporating but causes the sugar to be of a darker colour, and also to be partly converted into molasses, of which, under these circumstances, there is always a large quantity.

In dry weather, there is little sap to be evaporated, and what there is will probably be impregnated to a much smaller degree with gluten, &c., the diminished circulation of the sap permitting these matters to be absorbed and combined with the vegetable structure of the cane. The clarification of the juice is therefore easy; the quantity of water to be evaporated small; the quality of the sugar good; and the quantity of molasses small.

These considerations show how very important it is to have the works and all other arrangements made on such a large scale as to insure the taking off the crop during dry weather. The same reasoning will also, I think, explain the difference between the juice of plants and ratoons: the plant canes are said to be rank and difficult to boil; the rattoons to be saccharine and easily converted into sugar.

Old planters used to say whem improvements in sugar boiling were talked of, that the sugar ought to be made in the field. Dry weather is the best sugar maker ; it is the great agent in making a a good quality of produce, and I think that the above is a rational explanation of the cause.

The manure applied to plants, not only causes an increased circulation of the sap, but also supplies a larger quantity of it, and that sap is also richer in gluten and other injurious matters. It has the same effect, as wet weather upon the rattoons. If the plants are cut in bad wet weather, the effect of the manure will be very obvious, but if left until what may be considered as past maturity, the circulation of the sap may be so far stopped, and the gluten so far united by chemical combination in forming woody matter, that if the canes are cut, as they ought to be, in dry weather, tolerable sugar may be obtained from them, though not nearly as good at from rattoons.

It has lately been strongly argued, and with much plausibility that animal manures being rich in nitrogen, are injurious both to the quality and quantity of sugar, as they tend to form molasses and not sugar—the latter not containing any nitrogen, while the former contains a considerable quantity in the shape of gluten. Is has been contended that vegetable matter alone ought to be used as manure, as that substance affords nitrogen in the exact quantity required, and not in excess : and that by the means of vegetable matters, sugar would be formed, but not molasses. The matter is one of great interest, but the discussion of it belongs more properly speaking to the Essay where it was introduced, on the cultivation of the sugar cane. The arguments on the subject are already before the public. This Essay being confined to the Manufacture of Sugar, the subject only comes in here incidentally ; as we are to ascertain how we can best get rid of, that great obstacle in sugar boiling, rather than how we are to prevent it from forming a part of the juice. Sufficient has been said to induce parties to think how the sugar may be best made in the field.

From what we have said it will appear that plants should be allowed a considerable age, and that rattoons should be cut young ; but both must be regulated, to a considerable extent, by the weather and other circumstances over which the planter has little controul. And that cutting canes by the job is the best means of doing that work, as a fewer number of labourers is requisite, and as the work is also better and cheaper done than by the other methods.

CARTING.

The second division of the subject is the carting the canes to the mill. This is now done, on level land, entirely by wains, worked by six cattle each. When the roads are dry, these wains usually carry about a ton of canes. From fifteen to twenty loads of canes, are usually taken to make a hogshead : it thus appears that each wainload is about a ton weight.

The conveyance of such a bulk of cane as is necessary to be conveyed to the mill for a large crop, with regularity and facility, must be a matter of great importance. Hitherto the carriage has been confined to the employment of wains worked by six cattle. The question naturally arises, is such a mode of conveyance the best we can adopt for the purpose ? Putting the state of the roads out of the question for the present, it would appear that there is a misapplication of labor here, for it is considered in England that one horse carts should carry a ton for their day's work. If one horse carry a ton, two cattle should certainly be able to do the same. Here then would appear to be a great misapplication of labour, the employment of six cattle to do the work of two. How can this be accounted for ? The force of habit, I believe to be the chief cause, but the heaviness of the wain is also another. The roads being sometimes very bad, during wet weather, will be pleaded as an excuse for the wains being made strong and heavy, and for the employment of so many cattle ; but this will not account for the use of these same means in dry weather, when the roads are hard.

Many of the planters visiting Kingston may, I dare say, have remarked with astonishment, as I did myself, the immense loads of grass carried in Derbyshire's two-cattle carts about the town for sale. They are far larger in appearance, when leaving the grass-yard, than a wain load of canes, and yet this great load is drawn by two cattle with facility about the streets of Kingston ; and although our roads and intervals are bad enough in wet weather, yet in dry weather, I think they will not lose in a comparison with the Kingston streets, although this is not paying them a very high compliment. I made enquiries about the weight of the load carried, and was informed that, at starting from the grass-yard, the load weighs more than a ton and-a-half ; that the same cattte work every day, and nearly all day long, and that they are not corn fed ; this last I asked particularly about, as I expected that such would be the case from the cheapness of corn compared to grass in town, and also as being necessary to enable the cattle to do the large quantity of work stated.

On an estate where I lived some time ago I made two light carts, and worked them with two cattle each, and was quite surprised to find that they did nearly as much work as the large wains with six cattle; they carried about two-thirds the load of the large wains, but went backwards and forwards in less time than the others. I had one smart boy to work each of them, and he used to jump into the empty cart, and make the cattle trot away in style. The carts should be made strong, but a great degree of strength may be combined with lightness by a proper application of the materials.

In "British Husbandry" and the "Horse," light four-wheeled waggons are much recommended for drawing with two horses; and a gentleman farmer from the United States, now here, tells me they are much used in his district, only worked by two cattle instead of two horses. He sends his waggon drawn by two cattle, containing a ton and-a-half of produce, to market, eighty miles; which distance the cattle go, and return empty from the same distance, and that too over hilly country, and much worse roads than ours, in six days.

The advantage in having four-wheels, although the friction is slightly increased, is, that in going over ruts or bad places, only half the load has to be got over at a time; and the load is not thrown upon the cattles' necks as when only two wheels are used; so that, instead of having a part of the load to carry, their whole power is applied in friction. These waggons, from the want of means of upsetting the load would be more desirable for carting produce to the wharf than for carrying canes to the mill.

Having indicated the method by which wain carriage may be improved, I will now proceed to consider how far it might be advisable to lay down railroads for carrying canes to the mill. The advantages of this practice must chiefly depend upon the relative situation of the cane-pieces and the manufactory. If the manufactory is centrally situated, it would appear that the plan could not be beneficially adopted, as a railroad would have to branch in each direction, and the quantity of canes to be brought along each would be so small, as not to save as much in expense as would remunerate for the outlay in making the railroad. When, however, the whole, or a great part of the produce of the fields is brought along one interval, which is frequently the case, it is probable that wherever a considerable crop is made, the result would be very advantageous.

It is not necessary that the level of the land should be at all altered; there need be no excavation, nor any filling up. The railroad may simply be laid on the surface of the ground as it stands at present. What then, will be asked, is the advantage of the railroad? It is the difference between drawing a load along a soft and rough surface on the one part, and a hard unyielding surface on the other. And what is the amount of this difference? A horse can draw a load on a railroad that requires ten horses on a common road. The amount of inclination of the road is of no consequence; if the cattle are at present able to carry a ton weight along the road as it now stands to the mill, they will, when iron rails are laid on the surface of that road, without at all altering the inclination, draw ten tons. The advantage to be derived is the doing ten times the work with the people and cattle at present employed, or the doing the same quantity of work with one tenth of the means.

The "Horse," winds up the article on "draught," after comparing the different kinds of roads, the application and theory of animal draught, &c., with these words. "This brief description is sufficient to give a general idea of the construction of railways, which is all that is necessary for our present purpose. It will be easily conceived that hard cast iron wheels, running upon smooth edges of iron in this manner, can meet with but little resistance, except that arising from friction at the axle. Accordingly we find, upon a well constructed railway, in good order, that the resistance does not exceed, in any sensible degree that which must arise from this cause. It has been found that a force of traction of 1 lb. will put in motion a weight of 180,200, or even in some cases, 250 lbs: so that a horse, exerting an effort of only 125 lbs., would drag on a level ten tons. This is about ten times the average effect of his work upon a good common road, and, as it arises entirely from the hardness and smoothness of the road, we cannot conclude our observations by a more striking and unanswerable argument than this, in proof of the immense advantages, and saving of expense which would result from greater attention to the state of the roads."

I have advised with an eminent mechanic on the best and cheapest construction of a railroad, for the purpose of bringing home the canes. We propose a wooden sleeper every three feet placed across the road, and laid on the surface of the interval. These sleepers should be about six feet long, and should be of logwood, cashew, mammee, or fiddle wood; these being th est timbers for resisting the effect of moisture. Most estates h bers of their own, and the cutting and carting of them, of them down, would not cost more than a shilling twenty two shillings a chain; or even say one hun mile.

The iron rails should be made of wrought iron, as being cheaper than cast iron. Wrought iron rails are now made of the same T shape as the cast iron rails; bear a much heavier load for their weight; and being made in much longer lengths, the weight is distributed over several sleepers, so that there is a less tendency to sink them into the ground. The cost of them is about £3 10s. per ton, but with freight and charges, up to the time of reaching the estate, this would probably be increased to £5 per ton. The rails should be tolerably deep, but need not be heavy; about 8lbs. to a foot in length of rail is considered enough; which would give twenty-four lbs. for a yard of rail, or 48 for a yard of the double rails. The chairs to support these rails would be of cast iron, and would weigh about half a cwt. per yard, or half a ton per chain, or about forty tons per mile. Forty tons, at £5, amounts to £200, with £100 for the sleepers, makes about £300 per mile. The laying the chairs and the rails is easily performed; the rails are pinned to the chairs, and the chairs nailed to the sleepers; any body can do it, the only caution necessary is to keep the rails parallel. Cast iron wheels with flanges and the axles for them would have to be imported, but the estate's carpenters would make the cart bodies which require no care in the making.

If the sleepers are laid on the surface of the road, the track between the rails should be gravelled to the depth of the sleepers, to prevent the cattle tripping over them; it would also tend to keep them steady, and being porous, would allow the water in rainy weather to drain away from them quickly. In this way they are likely to last much longer than if sunk in the ground. About four inches depth of gravel would make a good firm and dry road. It would take five cubic feet of gravel for a yard of the railroad, and a cartload of gravel being about a cubic yard, or twenty-seven feet, a cartload of gravel would be sufficient for five yards, of four cartloads to a chain. The loading, carting, and spreading of this gravel, if the gravel is to be had with facility, and at a moderate distance, and without reckoning the value of the cart and cattle employed, should not be more than a shilling a load, or a dollar per chain.

If the front wheels of the waggons are made to turn in the same way as the front wheels of coaches, the railroad may be made to curve in any direction, the rails of the road being laid down, being heated and bent to the degree required. The tongue of the front carriage would be turned by the cattle; and the short tongues of the second and subsequent ones being fastened to the back of the front carriage, would gradually turn them in the same way.

Thus we see that by simply converting a soft road into a hard one, without levelling or straightening it, we derive such great advantages as saving nine parts out of ten of the means of carriage employed. We carry the canes to the mill at one-tenth the manual and animal labour.

To repay the outlay of 300*l.* per mile, it is necessary that a considerable amount of traffic should pass over it. Such a railroad would be very suitable for the main interval or intervals of an estate, along which the whole canes for the crop must pass, but would evidently be an unnecessary waste of money for the cross intervals, where only a few loads of canes pass annually. No estate could well do wrong in laying half a mile of it along the first part of the main interval: a trial in this way would soon show how far it would be advisable to continue it.

As to the width at which the rails should be laid down. Three feet or four feet would be plenty for the stability of the carriage, as the speed of travelling need not be more than a walk of three miles an hour. If a horse is used for the draught that distance would be sufficient: but if two cattle are to draw a-breast, it will require them to be five feet apart; and perhaps this would be the most advisable distance, giving the sleepers a greater bearing on the ground.

I do not think that there would be any fear of the sleepers sinking into the ground in wet weather, as when the ground was soaked with wet, the work would stop, the carts not being able to bring the canes from the cane-pieces to the nearest part of the railroad without great labour. And even if it were absolutely necessary for a short time to work during wet weather, still I do not think that any displacement from sinking would take place. In a wain at present, the whole weight of the load, about an inch, rests upon the bottom points of a pair of wheels; each of which wheels presents a surface of about a foot in length, and five or six inches in width of ring-tyre, when sunk in the ground; this makes the supporting points of the wheels for a ton weight only one square foot, and of course the load sinks into the ground. In the railroad, each sleeper being about six feet long, and six inches wide, presents a surface of three feet to bear up a load; but the wagons being four-wheeled, only half the weight would at any time pass over the sleeper: so that it would have three times the surface, and only half the weight to support. But the rails being made twelve feet long, reach to four sleepers, and being made stiff enough to prevent bending, the load would be spread over a still greater space.

As yet there has been but one railroad that I know of erected in this island, for the conveyance of canes to the mill from the field. I mean that erected by Mr. Price, the enterprising proprietor of Worthy Park, in St. John's. The result as far as I have been able to ascertain is very satisfactory.

Before closing this chapter on the conveyance of the canes to the mill; there are two contrivances which in hilly situations have been found very beneficial. I mean wooden shoots and rope shoots for throwing canes down hill. These have been found very advantageous in many instances. The wooden shoot is rather a sloping three sided wooden spout, down which the canes are slid.—When a rope shoot is used, which has the advantage of being moveable, the canes are suspended in bundles by hooked sticks below the rope which is stretched as tight as can be by a windlass, the bottom end being brought close, if possible, to the works, and the canes slide down with great velocity to the bottom: they are then taken off the crooks, and these are carried up to be again used.

There has also been another mode of conveyance for bringing canes to the mill lately adopted at Duckenfield, in St. Thomas in the East, namely, by the employment of iron boats on the stream formed by the tail water of the mill. They carry five wainloads at a time, and are dragged by two cattle. They therefore save much wain labour. They might often be employed to advantage on level estates, as they only draw a foot of water when loaded.

GRINDING.

We now come to the third division of our subject, the grinding of the canes at the mill.

There are only two kinds of mills employed for this purpose, whatever may be the moving power, namely the vertical and the horizontal mill. In each case it is composed of three rollers, between which the cane is twice passed. These are regulated so that the roller at the side where the cane enters is wider open than the one at which the trash passes out. The strain is thus equalized upon the rollers, the cane being only half crushed by the first roller, the remainder of the juice being expressed by the second roller. Care should be taken to see that such is always the case, as I have frequently seen the first roller braced so tight that the whole operation was completed by the first roller, thus increasing the strain both upon the moving power and the machinery, and causing the trash to be much more broken by the sudden pressure than it would be by the more gradual pressure when the work is divided between the two.

Horizontal mills have a great advantage over vertical ones in being fed with much greater ease and regularity; one person will put the canes into a horizontal mill with much greater ease than two into a vertical mill. The canes are also much more equally distributed along the rollers, causing a much less strain on the machinery, and causing the trash to be less broken. These mills also offer a great facility for connecting machinery to them, either for bringing canes to them, or for carrying away the trash from them.

The moving powers at present in use are cattle, wind, water and steam.

There are two kinds of cattle mills, which may be called the one-story, and two-story mills. The latter, I believe, are more commonly called cockpit mills. In the first the cane carriers walk to the mill on the same level with the cattle: in the second they pass under the cattle's feet through arches purposely made, and the mill is also below the level of the cattle. This is a far more advantageous arrangement than the first; the people can go in and out to the mill, without passing between, and disturbing the cattle; but there is also a much greater advantage in the application of the lever by which the cattle are attached to, and turn, the mill. In each case the levers are inserted into the timber of the main or middle roller as close to the mill cases, as the frame work of the mill will allow. In the one case these levers are brought to the level of the cattle, and they pull directly upon them. In the other case these arms or levers are elevated considerably above the cattle, and a secondary timber, or smaller arm, has to be attached to the main arm above, so as to enable the cattle's power to be connected with the main levers. This connecting arm or lever, being placed in an oblique position, yields in the draught, and therefore a great part of the cattle's power is lost.

These mills are worked either by mules or cattle. Mules are generally kept at a trot, and will therefore go twice or three times round for one turn of the cattle, but they do not grind so many canes at a time.

The horizontal mule mill, Collinge's, at Hyde Hall, in Trelawny, grinds Bourbon Canes to make a hogshead in five hours; or two and-a-half hogsheads a day, as regular work. Vertical mills seldom make more than a hogshead a day with Montblanc canes, or one and-a-half with Bourbon. Bourbon canes should always be cultivated where the only power is a mule or cattle mill, they are so much easier to grind. With Bourbon canes, cattle will fill a clarifier in two thirds of the time that they will with Montblanc canes.

Eight, ten, or twelve cattle are usually employed in these mills. This appears to me to be a misapplication of power and labour. A singular circumstance brought this truth to view. I was waiting for the cattle to be brought home from the pasture to be put in the mill, and a thought struck me that I would try how many canes I myself could grind; it was more for amusement than any thing else that I did it; and to my surprise I found that I could grind five canes at a time by pushing upon one of the sweeps, and exerting my whole power. The power of a horse is reckoned equal to that of five men, and supposing that it is double that of a cow, this would give the power of a cow as two and-a-half times that of a man. Reckon my exertions at even half a cow power, and it would be expected that twelve cattle would be able to grind twenty-four times five, or 120 canes at a time; I found, however, that they would not grind more on an average than about thirty canes. How is this? Can it be that the friction can be increased to so great a degree? There appears to be no other explanation that can be given for the fact.

How does the friction arise? If the canes were equally spread one by one along the rollers, the friction would only increase in the proportion of five to thirty, and therefore, according to the calculation of strength, three cattle ought to grind the thirty canes, which at present take the power of twelve. This resistance can only arise therefore from the crowding of the canes, which is always the case in vertical mills. The canes are held up by the feeders in bundles in front of the rollers; as soon as the rollers take hold of them, the canebands holding the canes together in a bundle are loosed; but still the canes are drawn through nearly in a bundle, and, as they cannot spread sideways to any considerable degree, they force the rollers to open wide enough to allow them to pass, and this must be done with a very great strain. In a horizontal mill the same canes would be spread along twice or three times the surface of roller, and therefore be drawn through with ease.

At Hyde Hall, although the mill is horizontal and five feet long, yet to insure the distributing of the canes equally along the rollers, a simple but most excellent contrivance is used. A grating is placed in front of the feeding roller to prevent more than one cane passing through at a time: it is like a large comb, and the canes go through between the teeth. It will be at once perceived that this insures the canes being put in singly. If such could be applied to a vertical mill, there is no doubt that a great advantage would be the result, and more work would be done with less stock.

The value of horizontal mills to that of vertical is reckoned to be as two to one. The first horizontal sugar mill was erected at

Amity Hall, in St. Thomas in the East, by Mr. Noyes, in 1817.— It was fairly tried in comparison with the other vertical mill on the estate, as all the estates had then two mills. They were both worked by water, and with equal supplies of it, and the horizontal mill made sixteen, while the other only made six hogsheads. Of this result the increased effect, to the extent perhaps of four hogsheads, was due to the water wheel being at the same time put on a better construction. This would make the advantage in favour of the horizontal mill still as two to one. The advantage was so obvious that they immediately came into general use on the large estates in the district.

Wind power, being precarious, is gradually going out of use in this island. In Barbados and the smaller islands it is still their chief power, and I am told that three hogsheads a-day is considered a fair day's work for the mill. I never knew breeze mills do that in this country. Their having nothing but Bourbon canes to grind probably conduces much to this effect.

Of all the moving powers, running water is the cheapest and best. As the object of the present Essay is not to propose alterations in the mills, but simply cheap methods of making them more effective, it is needless to discuss the relative value of the moving powers.

The description of the different water wheels does not properly belong to the essay, but there is a simple way of making breast-wheels more effective, which may be noticed here. It is a plan that was first adopted by Mr. Noyes. It is the making the water flow over the top of the flood gate, instead of underneath it, thus increasing considerably the effective depth of fall, or power of the water. As this alteration can be made at a trifling cost, and is a great improvement, it should be adopted in all breast mills.

Steam power is the most troublesome and expensive of all the powers. The cost and carriage of coals at present is great, but if the boiling of the coppers is improved, as it may be by the improved system of hanging them to be hereafter described, this expense may, to a great extent be done away; such is the quantity of trash saved, hat it would nearly suffice for fuel for a steam engine.

The difficulty in getting good people to keep the engine at work is also great; and the constant wear and tear of them is always very considerable. They are better adapted for large estates than for small ones.

In Demerara the boilers of the engines are placed where we put our clarifiers, and the waste fire from the coppers is sufficient, after fairly starting the engine, to keep up the steam ; and this of course economises fuel considerably. The clarifiers are then heated by steam, and this should be done by the waste steam from the engine of a high pressure engine, or by the waste hot water of a low pressure engine ; or by the heat in the flue after leaving the boiler, and on its way to the chimney.

There appears to be no saving of fuel in the application of steam raised purposely for heating liquids ; for although a small quantity of steam at a temperature of 212, will heat a large quantity of water to the same degree, by giving out its latent heat ; yet, still the same quantity of fuel that causes the latent heat to enter into steam, will cause the large quantity of liquid to assume the same sensible or real temperature. The heat obtained from the waste steam is clear gain, but the heat gained from extra steam raised in the boiler to heat liquor is only the same as would be gained without the intervention of that steam. The application of steam for heating, is chiefly applicable to liquids, which injure by being heated to a greater degree than that of steam, or 212 ; and as steam will not heat liquids higher than that, it is a beautiful medium for communicating that degree of heat.

We have now described the two different kinds of mills, and the four different moving powers usually employed. It now remains to show how labour may be economized in the working of mills generally.

The first process in grinding is the carrying the canes by manual labour from the place where they are thrown down in the cane-yard by the wains, to the mill. By the application of a piece of machinery called a cane-carrier, almost all estates would save the labour of two or three people in carrying canes. For small estates it might not, perhaps, repay the necessary outlay, but on the larger ones it would soon do so.

Nearly all the estates in Demerara have these cane-carriers which extend from the mill to the canal side—the canes are thrown out of the canal boat on to the cane-carrier which is a broad, endless belt of iron plates constantly ascending to the mill ; the canes are thrown on this, and gradually reach the mill, where a person spreads them as they are drawn in. A couple of hands are sufficient to throw the canes upon the bottom end of the cane carrier. The machinery is not found to take off any sensible power from the mills, as the increased friction is counteracted by the diminished strain caused by the more regular feeding of the mill.

One of these cane-carriers was erected twenty-five years ago, by Mr. Noyes, at Belvidere ; it was the first put up in this country, or I believe, any where else ; it was his own invention, and has since been constantly in work with good success. There is one put up at Dawkins' Caymanas, which saves the labour of three people. There has also been one for a length of time, at Amity Hall, in St. Thomas in the East.

At Hyde Hall breeze mill, there is a very cheap and effective plan of raising the canes to the mill by means of two wagons and a railway. As one wagon comes down the inclined plane empty, the other one is pulled up full of canes by a mule. The platform has a considerable slope, and is broad at the bottom, and narrow at the top. When the wagon reaches the top, it stands directly in front of the mill, and serves in lieu of a cane-table, the front end of it being open. When it is emptied, the mule hauls it down, and the same operation hauls up a full wagon which has been loaded in the meantime to supply its place. The way in which they are made to pass each other, is by the outside wheel of each cart being guided by the rail at the outside of the sloping platform ; and the length of the rope is so arranged, that the descending wagon reaches the part of the platform where there is width for the two carts to pass, before the full cart reaches the spot ; the two guiding rails forming the shape of the letter V reversed Λ. Two boys are sufficient to load the carts, and one boy to mind the mule. This is a very simple, cheap, and easy application of machinery, and is very suitable for many estates.

If railways for carrying canes from the field are adopted, the same carriages after being brought from the field full of canes may be drawn, one by one, upon an inclined railway from the present cane yard to the mill, without being unloaded in the cane yard, which would only be giving double trouble. In this case a double set of wagons would be required, one set loading in the field or on their way backwards or forwards, while the other set remained to be unloaded one by one at the mill. As unloaded they would be put on a short branch railway. The wagons might either be hauled up by a mule or by a rope attached to the mill itself.

In many places, particularly in Saint Thomas in the East, the mills have been lowered to the level of the cane-yard. In this case the wains bring the canes close up to the mill, and no cane-carrying machine is needed, but a much fewer number of people are employed. In this case the liquor must be elevated to the original height of the floor of the old mill by machinery. In some cases common lifting pumps are employed for this purpose ; in others a chain bucket pump, or liquor elevator, is used ; a series of copper buckets attached by iron links constantly revolving round an upper and lower drum, scoop up all the liquor out of the reservoir below the mill, and deliver it at the top into the old liquor gutter. There is a chance, in this case, of the liquor, especially when of poor quality, becoming tainted or partially acidified. This has some times been found to be the case, though generally speaking there seems to be no injury sustained. One of the elevators has now been in use nine years at Golden Grove, without any bad results being perceived. Dr. Ure says that in Demerara the pumps used for this purpose require to be carefully set, so that they lift up the liquor without sucking air along with it at each stroke, which churning as it were of the liquor makes it acid. As it is cheaper to erect a cane carrier, than to lower the mill, and as the saving of labour is as much in the one case as another, it would seem advisable to prefer the erection of the cane carrier, and thus prevent all chance of acidity in the liquor.

A proposal is at present being made for extracting the juice from canes by an hydraulic process: that is by pressure on the same principle as Bramah's press. It does not appear to me that it can be brought to a successful result. Any amount of power necessary to crush the canes can be obtained, but it is a principle in machanics that what you gain in power you lose in speed ; so that although you could make the machines so powerful that one man could crush a wain load of canes at a time, still it would be a most tedious operation. The difficulty of packing and repacking the machine is also an obstacle to be overcome almost insuperable.

It appears to me that nothing can be more simple, cheap, or effective than the extraction of the juice of the cane by a pair, or series of pairs of rollers. There is a constant stream of canes entering into the mill, and a constant stream of trash passing out at the opposite side, and a regular power of pressure can be applied, to the exact amount demanded, so that there is neither loss of time or loss of power in a well constructed and properly worked mill.

I think that the best mill of the kind that could be constructed would be a horizontal mill with three pair of rollers, close to each other, and regulated so that the first would be about five eighths of an inch open ; the second three eighths ; and the third, one eighth. I do not think that the friction of the three pair of rollers would be much greater than that of the three rollers (or two pair of rollers in regard to friction, the middle one doing double duty,) at present used ; and the canes would certainly be much less broken, and the juice would also be more effectually expressed. I read a description of a mill of this kind, which appeared a year or two ago, in the

Mechanic's Magazine, and for which, if I remember right, a patent had been taken; I am sorry to say, however, that I have forgotten the party's name, and I have no means at present of referring to it. It struck me as being the most advantageous plan of a mill that I had seen.

Canes upon being ground, yield about two-thirds of their weight in juice, and one-third in trash. From fifteen to twenty tons of canes are ground to make a hogshead of sugar—there have therefore to be carried away to the trash-house—six or seven tons of trash for each hogshead made: and as the trash-houses are usually placed at a considerable distance from the works to prevent accident by fire, it becomes a matter of considerable importance how this may be most economically done.

The carrying away of the trash has, since freedom, been the greatest obstacle in the way of the planter in conducting the manufacturing process. Carrying it on the head in baskets is a disagreeable business and hard work, and the women by whom it was done in slavery generally objected to the work when they became free; and the men did not like the work, not being accustomed to it. It was therefore a great obstacle to making a good week's work, and it therefore became the planter's first endeavour to do away with manual labour, or to reduce it in this department of work.

On some estates mule carts are employed to carry it from the mill to the trash-house where it is then packed by hand. But the plan most generally adapted is by the erection of railroads from the mill to the trash houses, along which it is conveyed in small carts. These have been found very advantageous wherever they have been adopted. Many of them are simply wooden railroads, but the laying down of light iron rails for the truck wheels to run upon, facilitates the labour very much. The railroad should be nearly level with the beams of the trash-house, as then the carts are easily rolled along by a single person. At Plantain Garden River Estate, there is a long railroad of this kind, with iron rails, and I have myself rolled the cart along with the greatest ease possible; in fact the wind almost blows it along.

There are several ways of elevating the trash to the necessary height. It is done at Gibraltar, in Metcalfe; and at Amity Hall, in St. Thomas in the East, by the use of the same machine as has been recommended for lifting canes to the mill; in fact at the latter estate, the mill having been lowered, the cane elevator is now made a trash elevator. Trash can be elevated at a much sharper angle than canes, which are apt, if the slope is considerable, to slide back.

The elevator is a kind of broad endless chain band, the width of the rollers, and working on two drums connected with the mill, which is horizontal, and revolving with exactly the same speed as the rollers. The trash delivers direct from the back roller upon the elevator, and commences its assent up the inclined plane of the elevator, immediately on leaving the mill. As the elevation is considerable, about forty degrees, the ascent is facilitated by small slips of wood, about thirteen inches high, fastened crossways on the plane surface of the elevator, and which catch the ends of the trash and prevent their sliding back. At Amity Hall, when the trash reaches the top, it shoots over the top, down into a kind of box-funnel, which has a trap door to be shut when the cart is away; but while the cart is loading, the trap-door remains open.—Two people load and roll the cart along the railroad, which is level with the top of the beams of the trash house, and upset it in any part of the house required: they then return, open the trap-door of the trash receiver, and load the cart again. At Gibraltar there not being room for a trash reservoir, two carriages are used, the moment one is taken away the other being rolled into its place. To effect this a short branch is made, on which the empty cart stands while the full one is rolled away; the connecting rail is then moved, and the empty one runs into its place.

In Demerara, on some estates, they load the trash cart at the mill, and then elevate the loaded cart by dragging it up an inclined plane to the level railway, when it is rolled along by manual labour. Perhaps as good a way as any would be to have the railway placed on the ground from the mill to nearly the trash house, and then to elevate the loaded trash cart up an inclined plane by a mule pulling a rope over a pulley.

On many estates the mills are placed nearly on a level with the roofs of the trash houses, and no contrivance for elevating the trash is required, but only a railroad and cart. Such is the case at Hyde Hall, where only two people are employed to load and carry away the trash from 2½ hogsheads. Such is the case also at Plantain Garden River Estate, where two people load and carry away the trash from 2½ hogsheads a-day. At Cromwell and Belfield in Metcalfe, the arrangement is also similar.

When the railroads were first brought into use, they were all made straight, but now it is found that curves can be as easily traversed as straight roads, by placing two small guide wheels in connection with each pair of wheels of the wagon, and turning them like the pole of a carriage. In this way the curves may very easily be overcome, as may be seen at Amity Hall.

In the construction of the carriages, I have tried several different plans, with a view of making them as easy as possible for the laborers. The one I have found to answer best is thus made. A strong oblong frame rests on two iron axles and four wheels, with flanges. These wheels should not be less than a foot in diameter, and should run on iron rails with the flanges inside. If the railway is straight, or nearly so, these wheels and axles must be fixed firmly to the oblong frame; but if there are considerable curves in the railroad, they must only be fixed by a pin in the centre of the axle, and must have guide wheels attached, one from each end of the axle, and projecting at right angles about two feet in front of it. These guide wheels are to be placed one on the inside of each rail, and it is evident that so long as the carriage runs on the straight part of the road, the guide wheels acting equally on each end of the axle, the carriage will run straight, but that whenever either of them reaches the curved part of the railroad, it will, acting with a leverage of two feet, the distance it is placed in advance of the axle, draw forward the wheel on its own side, exactly in the same curve that it is obliged to describe itself; the bringing forward of one wheel checks the progress of the other, the holding pin at the centre of the axle being the pivot at which the leverage in this case acts; and thus the carriage is made to turn the curves with facility.

On the oblong frame, at each end, is an iron, shaped like the letter V. reversed A. on the points of which rest the carriage; the carriage naturally therefore hangs to one side, to prevent which, two stationary supporting legs are placed at one side on the top of the iron pivots, and a moveable leg at the other side, and when these are in their place, the carriage stands upright. When the load is wanted to be upset, the moveable leg is pulled away, and the cart upset by a slight exertion. The side to which the cart upsets is usually left open, but I made mine with moveable side, hung by hinges from the top; it is necessary to elevate the hinges some distance above the top rail, to make the door open wide enough to allow all the trash to slide out freely. The moveable foot I attached firmly to this door, so that the one operation of opening the door, pulled away the foot at the same time. When the door is shut, the handle by which it is opened, is securely latched, and this latches the moveable foot at the same time.

The cost of a cane or trash elevator, and the putting of it up is about £200, but they may be reckoned to save the labour of four people, per day, on large estates, or from twenty to thirty shillings weekly. The elevator at Belvidere worked about fifteen years, taking off large crops, without repairs.

The cost of a trash railroad must vary according to the circumstances of situation, the height of the pillars, the length of it, &c.; but may probably average about £200, including carriages, cost of materials, putting up, &c., and will save, on an average, the labour of about four people daily.

Before dismissing this part of the subject, I must allude to one of the disadvantages caused by the use of railroads, for carrying trash to the trash houses, and from which I suffered severely myself. From the mode of packing adopted, namely, the throwing down the trash in cart loads from the railroad, a height of ten or fifteen feet, a very serious inconvenience was sometimes found to arise, from the trash not curing. It heated too much in the centre of the heaps, and after twelve weeks, was found to be so hot, that you could scarcely hold it in your hands, and it was a dark brown colour, evidently passing into the putrefactive fermentation.

It used to be a rule among planters, that the quicker trash was packed in the house, the better it would cure, I accordingly, on first using the railroad, used to pack one room or division of the house at a time, and consequently filled it twelve or fifteen feet deep in a day. I found the result as I have above stated, and altered the packing to three rooms at a time instead of one, and this was attended with some benefit. I afterwards altered it to six rooms at a time, so as to take six times as long as at first, and then it proved much better. But the centre of the heap, although the outsides would cure beautifully, still continue to remain hot and damp. Estates that cultivated Bourbon cane did not seem to be effected in this way, but several estates where the Montblanc cane was cultivated, suffered from it. The effect was attributed to several different causes, and it was some time before the real cause was found out. I rectified it by placing occasionally a layer of bamboos or brush-wood alternately with the trash, so as to allow the steam to percolate out better. But the other day I was shewn a most simple plan of avoiding it by Mr. Grace, at Plantain Garden River Estate. He packs one side of the trash-house regularly from end to end. At the first end he must keep emptying the cart till the heap rises to the level of the railroad; he then, however, always makes the people upset it, instead of throwing it at once to the bottom of the next empty room, nearly at the top of the heap already made, so that it shoots out with very little force, and slides gradually down the heap : thus the force of the fall is completely broken, and the trash cures easily. The remedy is beautifully simple, and therefore there is now no objection on that score, to the general use of railroads for packing trash.

It has been often and strongly urged, that a great loss of sugar occurs from the canes not being sufficiently squeezed at the mill, and that consequently a great part of the sugar crop is thrown away into the trash-house and wasted. If the mill is out of order, there can be no doubt that much liquor is unnecessarily lost in the trash-house, but, except in this case, or from gross carelessness in not bracing the rollers to a proper degree of tightness, I do not think that there is a loss of any liquor that can practically be avoided with our present mills.

A certain degree of speed is necessary to be given to the rollers to expedite the work, and I have often seen a small quantity of liquor, the last drainings as it were of the juice from the cane, reabsorbed by the trash. This would be prevented by giving the rollers a slower motion, but such would not be advisable in practice, the increased produce would not compensate for the slower progress of the work. In England the trash would be boiled to extract its sugar, and then be squeezed, and no doubt such a process would repay them for their trouble ; but we have no means of doing anything of the kind, and all that we can attempt is to look carefully to the mill, to see that no unnecessary loss occurs.

Planters have an objection to squeezing the canes too much, as it breaks up the trash, making it difficult to handle as fuel : but if the canes are properly spread in the feeding of the mill, so as not to cross each other, they will not be much broken, although subjected to severe pressure.

Unripe canes will not give out their juice to nearly the same extent as ripe canes, which may be shewn by passing a sucker through the mill : it will be found to come out quite wet and waxy like, and not half pressed. Ripe canes appear to give out the whole of their juice

A statement lately published in the Colonial Magazine, on the authority of Messrs. Robertson, Old Jewry, says, " that 33 per cent. is left unexpressed by the mill in the shape of juice." No planter will believe that one-third of the juice is left in the cane-trash, as he is in the habit of bracing the rollers until no juice appears perceptible in the trash on being twisted by the hand, or tasted in the mouth. Of this waste they say they have an improved mill that will save thirty per cent., but I have not seen a description of it.—I do not conceive that the loss at present sustained can average more than 10 per cent of the juice, even allowing for negligence and bad machinery. A mill with three pairs of rollers would be likely to extract, more perfectly, the whole of the juice, the pressure being more gradual, but with our present mill it cannot be quite perfect, and it only remains to recommend that constant attention should be paid in examining that no unnecessary loss occurs in this way.

BOILING.

Having passed through the various stages of the preparatory operations, we now come to describe the process of boiling the juice extracted from the cane.

The juice as it runs from the mill is received into copper clarifiers, of which there are usually three employed, that the juice may have time to clarify before being drawn down into the coppers for evaporation. In one clarifier, the juice is running from the mill ; the second one contains the juice undergoing the process of clarification by the application of the wasted fire from the coppers ; and the third one is being cleansed ready to receive a fresh supply of liquor. By means of flues with a damper to each, a part of the fire from under the coppers is passed under the clarifier, till the liquor is sufficiently heated, when the damper is put down, and the fire is turned under the clarifier into which the cold cane juice is running. The main or waste flue from the coppers goes direct away from the coppers to the chimney, and should have a damper to regulate the draught, else a sufficiency of fire may not turn off to heat the clarifier.

The clarifying of the liquor is the part of the operation of boiling generally the least attended to. The liquor is usually drawn down whenever it is wanted, without any regard to its state of clarification. This should not be the case ; it should never be drawn down till a thick scum has settled on the top of it. This scum is produced by the heat of the fire co-agulating the albumen of the juice, which in co-agulating and rising through the liquor, carries with it the greater part of the impurities, such as particles of the pith, or rind of the cane, dirt, &c. A careful process of clarification is very essential in assisting us to purify the cane juice. At a temperature of 165 to 170, the liquor throws up this thick black scum, but some people prefer the liquor to stand in the clarifier till it yaws or cracks, that is, till spots of white froth appear rising in places through the scum ; this takes place at about 190, and if the fire is continued longer under the pan, it soon commences to boil. I prefer the lower degree of heat, because the clarification appears as perfect as with the highest temperature, and there is less agitation in the liquor. When the temperature is higher, the internal motion of the fluid causes the lighter particles that would either settle at the top or the bottom, to continue circulating through the liquid.

Whilst in the clarifier the quick lime, or temper lime, as usually called by the planters, is added. I have not yet seen any satisfactory explanation given for the use of lime in sugar boiling. We all know that it is necessary to be applied, and that it always is applied, but we do not know the reason why. The reason most commonly assigned is, that it is to neutralise acidity; but there is no acid proved to exist in the liquor. Another reason assigned for its use is, to make the liquor clarify, but the liquor seems to clarify as well by heat without the lime. A third reason is that it makes the sugar granulate : we know that liquor can granulate though not finely, without its use. A fourth is, that it is to make the molasses separate freely from the sugar; this does not seem the case, for the more lime the worse the sugar appears to be; and the worse the sugar, the more the molasses seems to stick to it rather than separate from it. These are all the reasons that are usually assigned for its use. It can hardly be expected that a planter should be able to decide on such an intricate point. On the practical application of the lime I have much to say however.

It has usually been the practice to use a great deal too much lime in sugar boiling. I have seen very beautiful sugar made with an ounce of lime to a hundred gallons of liquor, when the same estate has often been in the habit of using nearly a pound for the same quantity.

The best way of applying lime appears to be according to a plan adopted in St. Kitts a few years ago. It is by the application of a saccharate of lime, that is by lime dissolved in syrup. When used in this way, a very small portion of lime is sufficient. I have frequently used it with advantage myself in this way. The lime is mixed in a half puncheon set on end ; to each pound of quick lime two gallons of boiling liquor out of the second teache are added ; the whole mass then boils up, and is well stirred about; the effervescence subsides, and the mixture assumes the appearance of thick cream. It is allowed to stand till clear, when the lime that is not taken into chemical combination sinks to the bottom, and the liquor assumes a clear brandy color. This brandy coloured liquor is then drawn off through a cock as required, and answers all the purposes of temper lime, though apparently there is no lime in it. If the liquor is supposed in the common process to require a pound of temper to a pan, use two gallons of this liquid in stead ; for half a pound, use one gallon ; and the liquor will in each case be as well tempered as before. Nearly the whole of the lime apparently remains in the bottom of the cask as a sediment, which would otherwise pass into the liquor. The liquor is said, when tempered this way, to be some shades lighter in colour ; I have never compared the two processes very accurately together ; but it appears to me a considerable improvement.

In tempering liquor, I never give the full quantity supposed to be required, in the clarifier, but retain a portion to be given in the second teache, in proportion just sufficient to make the liquor in the teache *cut*, as the boilers say.

The cutting appears to be the criterion in all cases of the quantity of lime necessary in boiling sugar. When the syrup drops off the edge of a skimmer, which has been dipped in the teache, and has been twirled a few times in the air to cool it, for the purpose of trying the temper ; when the syrup drops off in short flakes or drops, there has been temper enough used, and the boiler knows that the sugar will granulate properly. If, however, the syrup drops in long strings like molasses, then more temper is required, and the addition of either a little of the saccharate of lime or of the dry lime, will effect the necessary change, and make the liquor cut properly. But the addition of the lime darkens the colour of the syrup, and alters the smell in a trifling degree. This rule for the application of the proper quantity of lime may assist chemists in determining the real use of it.

Lime is said to combine with colouring matter, and it certainly darkens the liquor. My own opinion as to the application of it is, that it should not be applied to the clarifier, but partly in the grand copper, and partly in the second teache or saccharine. I think the clarification by heat alone in the clarifier most advisable, as thus the great mass of vegetable matters are separated on the coagulation of the albumen, before the lime can extract their colouring matter. If lime is useful in clarifying, it will assist in throwing up a thick scum in the grand copper, as well as in the clarifier, and a less quantity will be required, a great part of the impurities being already got rid of. This scum arises on the grand copper always in a similar manner to that on the clarifiers, as the liquor approaches the boiling point. It should not be in the least disturbed till the thick scum forms, and then, as simmering commences, it should be quickly skimmed off by hand before the boiling becomes rapid. It will be in a greater or less quantity as the previous clarification is perfect or otherwise, but a considerable quantity will always arise. These two clarifying processes being carefully conducted, very little work remains to be done in the way of skimming.

For the same reason that I object to the use of lime in the clarifier, I would object to the use of the whole of it in the grand copper; I would retain a part to be added in the second teache. If the use of lime is to be at all attributed to its value in neutralizing acidity, the second teache will be a better place than any for its application; it will here neutralise all acid formed during the process, and the liquor will be immediately afterwards concentrated into syrup.

Besides the methods described as used for clarifying the liquor, we use strainers to effect a separation of the other matters suspended in the liquor. A coarse wire strainer is placed to prevent the larger particles of trash, leaves, &c. passing into the clarifier. In ladling the liquor from the grand copper to the next one, a fine strainer is used to catch any particles that have been missed in the clarifying, or that are too heavy to rise to the surface; and subsequently, a still finer one is used to strain the liquor when being again brought forward from one copper to another, in its approach to the teache.

The dirt or scum that rises to the surface of the coppers, where the rapid boiling takes place, is lightly brushed off the surface with thin wooden brushes and sent back into the other coppers, where the ebulition not being so rapid, the scum settles on the surface, and is taken off with skimmers.

This constitutes at present the whole of the process adopted for clarifying liquor. Filters have been proposed for effecting more perfectly this process of clarifying, but all the filters yet proposed have been laborious and troublesome to clean, and they cannot do more than separate matters mechanically suspended in the liquor. I doubt much whether any mode of proceeding can be proposed more simple or effective than our present plan when properly conducted. When proper care is used in the tempering, clarifying, and skimming of the liquor—when good liquor is operated on—when the weather is dry, and when a good fire is kept up, good sugar will always be made. These circumstances it is not always in our power to combine, but the more of them we can combine, the better the produce will be, and some of them are always in our power.

A new proposal has lately been made for filtering cane juice in its progress through the coppers, and a patent has been taken out for it.

The patentees are sanguine of success, and affirm that it has succeeded perfectly on a small scale, and if a trial on a large scale is completed before this Essay is sent in, they have promised to inform me of its success.

We now come to the concentration of the liquor. It is our object to perform this in the quickest way possible. This is the great desideratum in sugar boiling. Whenever a good fire is kept up the sugar is improved in quality, and the more sugar can be made in a week, the cheaper it comes in point of expense. In point of fuel, Dr. Ure proves that a certain amount of fuel used in making a quick fire evaporates more water than the same amount of fuel consumed by a slow fire.

Our system of copper hanging has been hitherto very deficient, and far behind neighbouring colonies. In Demerara, three to four hogsheads for a set of coppers to make during daylight, is regular work. In Barbados they can make three in the same time, whilst we have usually made not more than one or one and a-half in the same period. The planters seem now to be alive to the advantages of attending to this branch. Mr. Lockhart and Mr. Noyes both about the same time undertook the hanging of coppers on the Demerara plan. The former unfortunately did not live to carry out fully his plans. The latter has been eminently successful. Several sets of copper are now doing nearly double the work they used to do.

At Golden Grove a single set of coppers has been hung with two teaches and two fires, and this set now does more work and in less time than the two sets used formerly to do. For several weeks it has averaged three and a-half hogsheads daily, and the work is finished by eight o'clock. The produce is also much improved in quality. The pans were re-hung and the chimney re-built on a larger scale at the same time. This appears to be necessary in all cases to obtain the full effect of the improved system of copper hanging; as a sufficient draught cannot be formed without.

At Winchester the same coppers were re-hung in the same position as before, but the chimney and pans were not altered, and the work is increased about half as much as before.

At Holland, a set of coppers was hung with two teaches and two fires, and does more work, and in less time, than the two old sets.

At Duckenfield, a single set has been re-hung, and does the work in just about half the time that the old ones took.

At Hordley, one set of coppers now does the work that two sets used to do, and in the same period, and the produce is estimated to be improved five shillings per cwt.

One great advantage gained in all these cases is the saving of an immense quantity of trash. Wherever the coppers have been re-hung success has been the result, but I have only mentioned the results on some of the larger estates where the benefit has been more accurately ascertaned.

The great means for effecting rapid boiling appears to be the exposing as large a surface of the coppers as possible to the action of the fire. and in making the flues and chimney very large.

Nearly the whole concentrating of the liquor takes place in the teache. I find by examining the temperature of the liquor in the different coppers that the second teache seldom goes up to 220, while the third, fourth, and grand coppers remain at about 214 or 215. When the teache first receives its charge, the liquor is about 214; it concentrates to 220, and is then filled up; each time it concentrates or boils down, the temperature rises, till at the boiling down the last time, it reaches 232, when the fire should be stopped, and the skip taken off. As then nearly the whole concentration takes place in the teache, it is of consequence that it should be placed under the most favorable circumstances for performing its duty.

In the new plan of hanging coppers, the teaches are made as shallow and wide as possible, and as much of their surface is exposed as can be. One foot of the bottom surface of a copper or engine boiler, in regard to its capacity for imbibing heat, is found to be as effective as four feet of upright side surface. There is an immense advantage therefore in having the teache shallow and wide. Dutrone's teache was only four inches in diameter less than his grand copper.

Many plans have been proposed for hastening evaporation, but none of them have yet been successfully introduced in this country. Kneller's plan of blowing air through the liquor appears the most feasible. I have been trying it myself, but so far without success; the power required to force the air through being too great to be economically applied.

Vallance's plan for boiling sugar without fire has not yet been published.

The precise point for pulling a skip, as it is called, or the exact period at which the syrup is in the most advantageous state for making sugar, is known by taking a ladle and dipping it into the teache bottom upwards, then drawing it out gradually but not very slowly, and watching the appearance of the syrup on it; for some time it will run off thin and watery, but it will soon assume the appearance of thick syrup, full of little bubbles of air, and run off slowly: at the same time, if the appearance of the boiling liquor is carefully watched, a change will be seen to take place; the ebullition which has previously been rapid, and caused the liquor, on the breaking of the bubbles, to jump about, even to the scalding occasionally of the spectators, now settles down in heavy thick boiling, without any jumping of the syrup; and immediately it assumes this appearance, and runs slowly off the ladle, the fire should be stopped. If the thermometer has been immersed, it will be found to indicate from 232 to 234, which is quite high enough.—As soon as the fire is stopped the striking takes place, either by opening the cock or by ladling the liquor out. By stopping the fire previous to skipping, the burning of the syrup on the sides of the teache is effectually prevented, the cold draught counteracting the heat reflected from the walls. Before the skip is finished striking, the thermometer will indicate 236, but the average of the skip will be about 234. If the thermometer rises higher than this the sugar will be overboiled, and the grain will be small.

The syrup now runs into the cooler, where it is stirred about to mix the first and the last part of the skip intimately together and it is then allowed to cool. When a thin crust forms on the surface of the syrup after a short exposure, it is again stirred- The object of this movement appears to be to mix the small grains, that are forming on the surface, bottom, and sides of the cooler, throughout the mass of syrup, to effect a more general granulation; and by breaking the crust on the surface, to allow the cooling to proceed more quickly.

Subsequent skips are thrown into each cooler successively, till the turn comes round to throw on the top of the first skip, which by this time has assumed a tolerably firm consistence. The new skip lies on the top of it, but is not mixed with the other.

This is the usual mode of cooling sugar, but I have found a great benefit to arise from a different method. I always throw a subsequent skip on the first one before it becomes hard; sometimes it is the second, and sometimes the third skip, according to the quickness with which cooling takes place; I then mix and amalgamate the two completely together, and then give them plenty of time to cool. I find by this plan that the grain is much improved; and it stands to reason that it should be so; the grains formed in the first skip become the centres on which the sugar of the second skip granulates; and the having extra time to cool also favors the formation of a larger grain.

There seems to be no rule adopted for the size of coolers, they are of all sizes; it appears to me that the best size of the cooler is when a skip fills it about two inches and a half, or three inches deep: if shallower, it cools too quickly; if deeper, too slowly.

It is usually recommended to pot the sugar when blood warm In Demerara, they find it more advisable to pot it perfectly cold. For this purpose they allow it to remain two or three days in the coolers. They say that a much larger proportion of sugar is obtained, which it is reasonable to suppose should be the case, as we knew that after potting our sugar the molasses that runs out of the casks deposits a quantity of sugar at the bottom of the molasses hole. I have followed the plan of cold potting, and certainly think it advantageous in increasing the proportion of sugar.

Connected with the boiling of sugar is the art of making a good fire. Liquor is injured more by the length of time it is on the fire than by the intensity of the heat, and whenever a good fire is made, the sugar is improved in quality. The colour of sugar appears to me to be caused by the concentration of the colouring matter of the raw cane juice, a part of which colouring matter first combines with the lime, and subsequently, through the medium of lime, with the sugar. The common opinion, that it is caused by the charring of a part of the liquor against the hot sides of the teache, appears to me quite erroneous, as, by stopping the fire in proper time before striking, there will be no burning take place whatever. With a slow fire, a chemical change takes place in the liquor, the nature of which I cannot explain, but the result is always bad sugar.

There is a great difference exhibited by different stokermen in the effect of their fires; one man will make it twice as good as another.—The whole art in making fire consists in keeping plenty of trash in the fire, and then leaving each bundle so as to close the mouth-piece. No air should get in except through the grating bars; and as each bundle of trash is shoved in, it should shove the previous one from the mouth-piece into the fire, and replace it as a stopper to keep out the air. If the mouth-piece is left open, the cold air enters and cools immediately the bottom of the teache, and the flame runs back to the other coppers. The waste flue damper should be so raised as to cause a sufficient draught to make the fire roar again, and so as almost to pull the trash out of the man's hand. Such is the case with the coppers in Demerara, where the boiling is the best that we know of. There the boilermen are the whole time employed in thumping down the liquor with their skimmers, to prevent it from boiling over the leads of the coppers, so furious is the foaming of the liquor. Their large chimneys are the great cause of their intense draught; they are so capacious that one of ours would go bodily into the flue of theirs, and they are also very lofty. A friend of mine, a planter from that country, when on a visit here, was quite disgusted with all the coppers he saw here; he said it would make him go crazy to work them. Great improvements have lately been effected by Mr. Noyes in copper hanging, but they are not yet quite equal in effect to the Demerara ones.

At Fort Stewart, in Metcalfe, a steam draught has been erected for carrying away the steam from the coppers, instead of allowing it to rise to the cupola of the house and escape. In their case they have no cupola. A sloping boarding reaches from a little above the boilermen's heads, at the front of the coppers, to an opening in the wall, through which the steam escapes; it is collected into a kind of board funnel and conveyed away. It answers well and saves the roof from rotting by constant exposure to steam.

Much time is wasted in ladling the liquor from one copper to another. I have found a two gallon ladle very efficacious at this work and it is just as easy to work as the small ones, if a long handle, with the heavy end out, is applied to it, so as to balance the weight. The ladles made of iron tinned are much cheaper than copper, and equally good.

An Essay on sugar boiling would be incomplete without a notice of the vacuum pan. Many of them are now employed in Demerara: at present there are only two erected in this island. One of them is a small one erected at Retreat, in St. Thomas in the East, and was intended to boil a skip at a time. It was expected that the liquor being boiled into the state of syrup by the common process, the heat it contained would be sufficient to complete the concentration of the syrup without any further application of fire, if the syrup were thrown into the vacuum pan and a vacuum immediately formed. Upon trial, however, such was not found to be the case, and it is not now in use. If however the only obstacle to its success was the want of sufficient heat, a small flue might have been made to draw a part of the heat of the fire under it. If the vacuum pan is used at all, it should be used in this way, to boil a skip at a time, so as to keep up the work continuously. The liquor might be taken from the coppers as soon as ever it was perfectly clean, without waiting for it to be concentrated into syrup.

The other pan is on a large scale and is erected at Mount Pleasant, in St. Thomas in the East. It is only lately put up, and the parties are not yet as expert in its use as they may be expected to become. It is capable of boiling three or four hogsheads a day.

The chief objection to the vacuum pan is the great expense of the first cost of the machine and of its erection; and also the great expense and difficulty of working it. It requires about four horse power to work the air pump. There is no labour or fuel saved; on the contrary both are increased. The whole benefit to be derived from the use of it is therefore confined to the improved quality of the produce. As yet the vacuum pan has not succeeded in making sugar of a better colour than the neighbouring estates, although boiling at eighty or a hundred degrees lower temperature. In fact, I saw samples of sugar made with a naked fire, in the common process, several degrees fairer in colour, and of as good a grain as that made by the vacuum pan. This fact goes strongly in opposition to the common opinion that our sugar is injured by the high temperature at which it is boiled. The sugar spoken of was made during a long spell of dry weather, when there being scarcely any sap in the cane there is little gluten to injure the colour of the sugar, or to form molasses. I have no doubt but that in wet weather, the vacuum pan sugar will be much better than that made with a common fire, as the low temperature will not so powerfully affect the gluten. This again shows that the planter's great object should be to make sugar in dry weather, when the canes are free from sap; and that he should also endeavour by his process of cultivation to have his canes saccharine and not rank; as it is the mucilage, gluten, and vegetable matters in the juice, which are the great obstacles to making good sugar.

The vacuum pan is said to convert a greater portion of the syrup into sugar, and less into molasses, than the common process. The advantage to be derived in this way is the difference in value of the extra sweets converted into sugar in the one case, and into rum in the other; and if a good system of distillation is adopted, there can be but little gain this way.

Our great objects in improving the common process are, improving the quality of the sugar and hastening the manufacture of it. These do not seem likely to be effected by a vacuum pan, in any degree compensating for the great outlay necessary to accomplish it. On the other hand great good has in both respects been effected by a simple alteration in the hanging of the coppers. Double the work is performed, and the sugar is improved several degrees in colour at a small expense.

I have shown the way in which the grain of the sugar may be much increased by simply altering the mode of cooling it, without any expense. I find on looking over Dr. Ure's Dictionary that he affirms exactly the same thing. I have also shown how the sugar may be improved by more care in the clarifying, tempering, and boiling of it, without expense.

On the curing of sugar it is necessary to make some remarks. The warmer the curing house is kept the better the sugar parts with its molasses. Curing houses are generally kept quite open, and exposed to a constant current of air. On the contrary, they should be kept closely shut up, and then the sugar would drain, as it does when shut up in the hold of a ship.

A stove is being tried in the curing house at Golden Grove, in St. Thomas in the East, for assisting the separation of the molasses; it is placed in the middle of the curing house, and can only affect a few casks near it; it is therefore being tried under unfavorable circumstances, as the circulation of air in the house is great. If a stove is used, a small fire-proof stoving-room should be erected, capable of holding ten or twenty hogsheads, and which might then be really stoved for a few days. This would be likely to extract all the molasses, instead of its being wasted on the voyage home, to the great loss of the Proprietor.

The formation of a large grained sugar is one of the surest modes of insuring the complete separation of the molasses; as where the grain is small, capillary attraction retains the molasses.

The sugar, before it is shipped, should be well rammed in the casks; by this means they will contain nearly one tenth more sugar; and in being rolled about, the casks are less liable to receive injury. After being rammed and headed up, the casks should be leaned on one corner, for two or three days, to allow the molasses again to drain.

Dr. Ure strongly recommends the boiling of cane juice into syrup for shipment, as affording the refiners at home the means of obtaining a much larger per-centage, even to the extent of 30 pe cent. of sugar, more than they can obtain by the common process of rrfining the sugar as sent them in the state of muscovado. He says it will save us a large amount of labour, but this does not appear to be the case, as we must concentrate the syrup almost to the striking point, and the only labour therefore saved would be that in the distilling, which is not much. The syrup could be shipped immediately, instead of having to remain a month or six weeks as sugar in the curing house, and this is an advantage; but more casks, and that too of the best description, and difficult to be therefore obtained required, which is a disadvantage. The price therefore obtained for the syrup, as comparedwith the priceof the sugar, and molasses or rum, from the same quantity of syrup, must decide the matter. Some has been shipped from this island on trial, and the result was, I believe, so favorable as to induce the parties to repeat the trial. The successmust also depend much on the rate of duty charged.—Dr. Ure says, we should save the loss of molasses draining from the sugar on the voyage, but this would probably be fully counterbalanced by the leakage of the syrup casks.

It has also been recommended to reboil our molasses and skimmings into sugar, instead of converting them into rum. Tolerably good sugar may be made by reboiling them, but the question resolves itself like the previous one, into the fact whether the sugar obtained in this way is more profitable than the rum usually obtained. It is the common practice in Cuba to reboil all, most of the estates having no distilleries. The expense of keeping a distillery is very great, and without large crops are made, the proportion of rum obtained is very small. This consideration would induce me to believe that on small estates it would be more advantageous to give up the distillery, and reboil or ship the molasses.

Mr. Churchill, in his excellent Essay on Sugar Boiling, which appeared in the papers about a year ago, recommends cane juice to be clarified by fire alone without the use of lime, in the same way as I have already advised. He then proposes to get rid of the gluten and fecula by the application of metallic salts, which would leave nothing but sugar and water to be operated on. If he will show us what salts to use that will perform this duty, and leave us the pure sugar and water to boil, we planters will very soon finish the manufacture, and deliver a fair muscovado sugar with scarcely any molasses ; and that by the common process of boiling, without filter, or vacuum pan, or any other thing but what we have in use at present. Liebig shows that it is the decomposition of the gluten by the aid of either alkalies, heat, or acid, that causes the giving off of ammonia, and the formation of an acid salt in the liquor, which prevents the sweet from crystallizing and turns it into molasses. The separation of the gluten is then the great desideratum for chemists to perform for us.

Dr. Ure says, that " acids exercise such an injurious influence upon sugar, that after remaining in contact with it for a little while, though they be rendered thoroughly neutral, a great part of the sugar will refuse to chrystallize."

There is no acid known to exist in fresh cane juice, but there appears to be acid in all syrup. Ure says, " Recent cane juice contains no appreciable portion of acid to be saturated." Porter says, " although no experiment, properly conducted, has ever indicated the presence of an acid as a constituent part of cane juice, yet no one seems to have doubted the existence of a body, without which it has been thought impossible to explain any necessity for he use of alkali." He goes on to argue that the use of lime and other alkalies is only to obtain the entire separation of the feculences, but in this he appears to be in error.

Liebig says that "every person who has entered a beet-root sugar manufactory must have been astonished at the great quantity of ammonia which is volatilized along with the steam. This ammonia must be contained in the form of an ammoniacal salt, because the neutral juice possesses the same characters as the solution of such a salt in water; it acquires an acid reaction during evaporation, in consequence of the neutral salt being converted by loss of ammonia into an acid salt. The free acid which is thus formed is a source of loss to the manufacturers of sugar from beet-root, by changing a part of the sugar into uncrystallizable grape sugar and syrup."

From these extracts, we see that cane-juice contains no acid, but that syrup does; Liebig shows us whence the acid comes, namely, from the decomposition of the gluten or albumen. He says that—"All organic compounds containing nitrogen, evolve the whole of that element in the form of ammonia when acted on by alkalies. Acids, and increase of temperature, produce the same effect." Now, by the plan I have proposed, of clarifying liquor at a moderate temperature, and without the application of lime, we shall be enabled to get rid of the albuminous matter, and of the solid vegetable portion of the juice, before the nitrogen of them can be decomposed, and the ammonia evolved by either alkali, heat, or acid—the only substance remaining in the liquor therefore that contains ammonia is the gluten, and if Mr. Churchill can show us how to get rid of it by any metallic salt, nothing but sugar and water will remain to be operated on.

Is it to neutralize the acid formed by the increased action of the fire on the gluten of the juice that lime is used? If so, would not the application of unburnt limestone, either in the coppers, or in the different strainers through which the liquor must pass, be the best mode of neutralizing it as fast as formed? Would an excess of limestone have the same effect as an excess of quick lime, in discolouring liquor? If not, limestone might always be kept in the coppers with advantage.

The smell of ammonia described by Liebig, is that we more powerfully perceive in the morning, from the liquor that remains in the coppers all night, and also is that of rank, or plant canes; and when we perceive this smell, we know that the result is always bad sugar. This shows that if we cannot hope to neutralize the glüten, as Mr. Churchill suggests, we should endeavour to prevent its gaining entrançe into the liquor. This will be, as Mr. Churchill says, 'aiming at the fountain head,' and will be what the old planters say, ' making the sugar in the field,' and with much truth.

As an encouragement to planters in this respect, I may mention that Dr. Ure says, 'when canes grow on a calcareous marly soil, in a favorable season, the saccharine matter gets so thoroughly elaborated, and the glutinous mucilage so completely condensed, that a clear juice, and a fine sugar may be obtained without lime."

REVIEW OF

MR. CARGILL'S PRIZE ESSAY

ON THE

MANUFACTURE OF SUGAR.

TO THE EDITOR OF THE JAMAICA TIMES.

Nov. 13, 1844.

Well, the five judges have taken five months to decide on the respective merits of the five Essays sent in for competition, and therefore their decision ought to be correct.

Let us see the merits of the one on which their choice has fallen; let us see if it is worthy of the princely donation bestowed upon it: let us see to what extent it affords information to the practical planter in those parts of his business in which he is least informed; let us see to what extent it promises to cheapen the cost of producing sugar, and also to what extent it is likely to improve the quality of it. An Essay written for the purpose of instructing the practical operators of the first sugar colony in the world ought, for the credit of the Island, to be abundant in all these particulars.

The grand proposition of the Essay is the recommendation of the establishment of central manufactories, on a large scale, for the manufacture of all the produce of each district, and the consequent abandonment of our present buildings, at least of our curing houses and distilleries. This is a startling proposition for the proprietors, and one which would require to be supported by very powerful arguments before they could be expected to sanction it. But how does the author support the proposition?

"In the first instance, it might be sufficient to try the experiment with the present system of boiling and distilling, for which some convenient estate might be selected, and slight alterations made to render the works capable of boiling and manufacturing the increased quantity of produce, (how this is to be done, and which is the very point the planters wish to find out, is entirely omitted!) " but eventually it would be desirable to introduce the most improved patents now adopted in England; and the vacuum pans, and general machinery manufactured by Pontifex and Wood, in London, seem to me, well adapted for my purpose." Here is all the information the Essay gives us on the proposed modus operandi at the central establishment, if we except a few words farther on in the Essay, that " filtration through animal charcoal, combined with boiling in vacuo," form part of their (Pontifex and Wood's) plan. This is the description of the improved plan in consideration of the advantages to be derived from which, we are recommended to abandon our present plan. Is this giving information to the public? And this, be it remembered, is the chief alteration recommended in the Essay.

With regard to the pecuniary profits to be derived by the planter from the adoption of this scheme, the author is not much more explicit. " An exact calculation," says he, ' of the saving of labour is not at present practicable, but I consider it would consist in the following items. In actual manufacture of produce ten shillings per hogshead.'

The planters, and probably the proprietors also would like to know how this has been calculated? For all the data that are given for calculation, we might with as much propriety write ten shillings loss. The expense of the stillhouse altogether ' saved."—Granted—but at the same time we may add, the profits also. 'No hogsheads required, but the puncheons in use would go backwards, and forwards between the estate and the boiling house." Granted. 'More than half the trash now burned would be returned to the field as manure.' And the deficiency in fuel at the central establishment must be made up by the purchase of coals. 'The immense saving effected would lie against the waste, the leakage and the pilferage that now take place, and which, every thing considered, cannot be less than ten per cent. besides the advantage to the planter of being able to pay exclusive attention to agriculture.' Will the planter have to pay no attention to the clarifying of the liquor, and the concentration of it from 2000 to 800 gallons? And will there be no waste, no pilferage, no leakage under the new arrangement?

These are all the data the proprietors have to go by in making, up their minds as to the profits they are to derive from the adoption of the plan proposed, and I dare say they will think them not half full enough.

'The profits of the central manufactory would arise,' says the author, 'from the increased proportion, and improved quality of the produce obtained from a given quantity of liquor.' But suppose, after having created a monopoly in favor of the central establishment, the proprietors of that concern choose to turn round on you, and say that they will no longer give the stipulated price?—Suppose the establishment is burned down? Suppose that more syrup is offered for sale than the manufactory can manage to work up? What remedy has the unfortunate proprietor in these cases? And what will he realise by the sale of the materials in breaking up his buildings to set against these probable contingencies?

Among the proposed advantages of the plan is the short time which it is contemplated will be required for the preparation of the liquor for sending to the central boiling-house, The author says—" the degree of concentration best adapted for all purposes would perhaps be that in which 800 gallons contained a hogshead of sugar. Less than one-third of the time required for obtaining sugar would suffice to concentrate the liquor to this degree, and the process would be attended with little labour. The author calculates 2000 gallons of raw juice to be equivalent to a hogshead of sugar, and as five skips of 80 gallons usually make a hhd. by what process of calculation does he discover that it will take less than one-third of the whole time requisite for boiling a hhd. to concentrate 2000 gallons' to 800, and more than two-thirds of the whole time to complete the concentration from 800 to 400 gallons?

There are two minor points in the consideration of this part of the subject I would mention. The author proposes not to clarify the liquor, but to concentrate liquor and feculences together before sending them to the monopoly house. " I would give no temper, and only such cleansing as a rough straining would effect.' Would this tend to enhance the price of the syrup ?

Again, he suggests, " that if Crossly's hydraulic press can be brought into practical operation, it may be possible to have portable machines wheeled to every canepiece, and squeeze the canes on the spot, and then carry the expressed juice home in liquor carts for concentration." To which add, and carry the trash home also in carts for fuel.

After the consideration of these points, I don't think that the author will be able to persuade many of the public to coincide in his suggestion, notwithstanding it is endorsed by the five judges.

There are only two alterations recommended in the Essay in the common process of sugar making. The one of these, namely, the admission of cold air under the coppers to complete the combusion of the trash, I admit as plausible and worthy of trial.

The other is the proposed method of clarifying liquor by subsidence. Here I believe that the author, though right in theory, will fail in practice. He proposes to clarify in the syphon without the use of temper, and by fire alone, in which I think he is probably correct. He then proposes to have a secondary syphon in which the temper is to be added to the already clarified liquor, to cause a second separation of impurities. I have no doubt the impurities will separate, but not in the time proposed, which is while the next pan is filling, for otherwise the work will not be continuous, which he says it is to be. My reasons for believing that the subsidence will not take place in this time is, from watching the process on a small scale in a tumbler. If you take warm liquor (and the author proposes to bring it to the yawing point, or 190, in the syphon) in a tumbler, and add a little temper lime to it, and watch the process of clarification, you will find that the impurities separated by the lime do not settle for a length of time, but continue constantly circulating with the liquid during the process of cooling. If you look at the glass sideways, you would think, from the rapidity with which the feculences descend, that the clarification of the liquor would be immediate ; if, however you look at the surface of the liquor, you will find that the same particles that are descending at the side are rising in the centre, and are constantly revolving and it is not till the liquor cools that the settlement takes place. Indeed, he admits the same himself. Now the same thing will take place on a large scale, and the matter resolves itself into the question, whether a large body of 300 or 400 gallons of liquor will cool down from 190 to 90, or thereabouts, in the short space of an hour or an hour and a half, so as to allow the work to be more continuous. Dutrone adopted the plan with success, but he allowed his liquor to settle twelve hours, which is quite out of the question with us.— The disadvantage of having to heat the liquor twice to the boiling point, and the consequent loss of fuel, is also great.

By this process of clarifying, the author expects to do away with the necessity of skimming, and consequently of saving one labourer in the boiling house. This is the only saving of labour by the common process that the author suggests.

The only information in the way of improving the produce, is by informing us of several different methods of tempering the liquor likely to be beneficial, and then leaving us to find out when one ought to be employed, and when the other, which is just the information required. 'It is clear,' he says, 'that the temper which is better adapted for one soil, may require modification on another; but I do not believe that any will be found to answer, which has not lime for its basis.' On this point, then, the enquiring planter may come to the Essay for information and return unsatisfied. This is too bad in an Essay written for the purpose of instructing the planters in the obscure branches of their business.

'The art of striking a skip of sugar, can be learned by ocular inspection only, and those who desire to attain it, must become the pupils of some head boilerman, who will teach them to distinguish the granular appearance on the back of the ladle, which denotes that concentration has been carried far enough.' Is it not rather extraordinary that the writer who sits down to instruct us in our business should give up the case as hopeless, and tell us that we must put ourselves under our ignorant servants for instruction in the very point in which he himself fails. The striking a skip must be a mystery only acquired by blacks.

With regard to the author's theory of the action and use of temper lime in boiling sugar, I would wish to speak with much diffidence. It is a point which we are all interested in investigating, as it is one on which we are very ignorant. He suggests that it is to neutralize latent carbonic acid, and he thinks he perceives the escape of the gas in the boiling of the liquor, but if such were the case, would it not be perceptible to the smell in escaping with the steam ?

The remainder of the Essay is taken up with a well written account of the process of sugar-making as commonly pursued, and consists of matters commonly known and in general undisputed.

In conclusion, we may ask, what amount of new information does the practical planter gain from this Essay ? What prospect does it hold out to him of improving his produce, and of economising the cost of manufacture ? I am afraid the public answer will be—not much.

The next question then that arises, is—Is this really the best of the Essays ? Is this the best specimen of our abilities that can be sent forth to the world as the production of Jamaica ? And is this to be the hand book and guide for the information of all those interested in the subject? I trust not. For the credit of the Island, I trust the other essays will prove better.

As the writer of one of the rejected essays I shall appeal against the decision of the judges to the candid opinion of a discriminating public, both for my own credit and for the credit of the island, and I will stake Agricola's reputation that public opinion reverses the decision of the judges. I am not bold enough to believe but that some of the other essays may be better than my own, and I shall be happy if such is the case, but I shall certainly appeal on my own behalf without any fear of the result.

AGRICOLA WHITEHOUSE.

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